JPRS 75103

11 February 1980

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 55

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50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. JPRS 75103	2.	3. Recipient's Accession No.

4. Title and Subtitle
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING
No. 55

5. Report Date
11 February 1980

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Joint Publications Research Service
1000 North Glebe Road
Arlington, Virginia 22201

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
As above

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The report contains articles, abstracts and news items on electronic materials, components, and devices, on circuit theory, pulse techniques, electromagnetic wave propagation, radar, quantum electronic theory, development and devices, miniaturization techniques on electric power machinery, power transmission, and nuclear power developments.

17. Document Analysis a. Descriptors

USSR
Antennas
Electromagnetic Spectra
Network Synthesis
Instruments
Lasers

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group 9F, 9C, 9A, 20N

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22161	UNCLASSIFIED	84
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 75103

11 February 1980

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 55

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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USSR UDC 621.375

CALCULATION OF THE DURATION OF PULSE PROCESSES IN AMPLIFIERS WITH ADAPTIVE PULSE-WIDTH MODULATION

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 48-51
manuscript received 4 Aug 78; after revision 19 Feb 79

ALEKSANYAN, A. A., GALAKHOV, V. A. and PERLIKOV, A. M.

[Abstract] A study is made of an approximate method of analysis of amplifiers with APWM, allowing design formulas to be generated which relate the duration of pulse processes in the amplifier to the operating mode and circuit parameters. The method also allows analysis of dynamic processes in the amplifier, i.e., determination of the duration of pulse processes when a signal of arbitrary shape is applied to the input of the amplifier, assuming that the rate of change of the signal is less than the rate of change of the HF component of voltage at the output of the low-frequency filter. The method thus allows accurate calculation of the length of pulse processes in static operating modes and estimation of the dynamic characteristic of amplifiers with a first order LF filter in the feedback loop. Figures 3; references 2 (Russian).
[52-6508]

USSR UDC 621.376.323

WIDE BAND MATCHING IN A QUANTUM PARAMAGNETIC TRAVELING WAVE AMPLIFIER

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 75-77
manuscript received 6 Feb 78

MARCHENKO, L. I., MYSHENKO, V. V., CHERPAK, N. T.

[Abstract] The results of a study of a symmetrical graded junction are presented. A delay system and a graded junction are analyzed, in which the height of the rods coincides with the height of the dielectric and the thickness of the dielectric in the graded junction coincides with the dielectric in the delay structure. Figures 3; references 3 (Russian).
[52-6508]

USSR UDC 621.396.07.089.6

CALIBRATION OF A SPHERICAL ANTENNA IN THE FIELD OF A PLANAR CAPACITOR

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 70-71

TISHCHENKO, V. A. and TOKATLY, V. I.

[Abstract] The standard field method is used to calibrate small antennas in the range up to 30 MHz. The standard field used in the method is created with a planar capacitor. Because the dimensions of the antenna are small in comparison to the dimensions of the capacitor the desired field varies little over a distance comparable to the dimensions of the antenna and it can be considered that the antenna is in a homogeneous field. An equation is presented for the field in which the antenna being calibrated is located, considering edge effects and the interaction of the antenna with the capacitor. Equations are presented for calculation of the error of the method. Tables 1; references 4: 3 Russian, 1 Western.
[55-6508]

USSR UDC 529.781:53.089.68

COORDINATION OF THE NATIONAL TIME AND FREQUENCY STANDARDS OF THE USSR, CSSR AND GDR

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 26-28

FEDOROV, YU. A. and PUSHKIN, S. B.

[Abstract] As a result of completion of the first stage of work in the development of the State Time and Frequency Standards Center at Uzhgorod, it has become possible to receive TV signals from Prague (channel K-7) regularly. In July of 1977, the UTC (SU) and UTC (Uzh) were coordinated by means of portable quantum clocks and the metrologic characteristics of receiving, recording and storage apparatus at Uzhgorod were studied. A diagram of the coordinating apparatus at Moscow, Uzhgorod, Koshitse (CSSR) and Prague is presented. Studies must be continued and hardware for reception and transmission of time signals over television channels improved in order to continue increasing the accuracy and reliability of time and frequency standard coordination. Figures 2; tables 1; references 3: 2 Russian, 1 Western.
[55-6508]

USSR UDC 621.397.61.-519

REMOTE ORIENTING OF A RECEIVER ANTENNA FOR THE 'MAGNOLIYA' MOBILE TELEVISION STATION

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 11, Nov 79 p 65

BEREZHNOY, N. V., Tatarian Radio Telecommunication Center

[Abstract] The mobile color TV station "Magnoliya" will be used extensively for programming of telecasts during the 1980 Olympics. This station is now equipped with a TM-308 radio link, which includes a receiver antenna set without means of remote orienting. This deficiency will be eliminated and convenient operation will be provided by a servomechanism built at the Tatarian Radio Telecommunication Center. It is a selsyn set with rotation limited to 270°, the transmitter to be mounted in a PLT-453 tracking console and the receiver to be mounted together with the antenna on an adapter platform for the standard ATM-403 crank box. The pedestal, usually carrying a parabolic antenna and a waveguide, has been modified for this purpose with adequate moisture proofing. Electrical connections are made through TKPSP-37 and KRK cables. Figures 2.
[69-2415]

USSR UDC 778.588:65.012.2 ASUTP :681.322

OUTLOOK FOR APPLICATION OF ELECTRONIC AND COMPUTER TECHNIQUES TO TECHNOLOGICAL PROCESSES IN CINEMATOGRAPHY

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 11, Nov 79 pp 7-17

ARTYUSHIN, L. F., All-Union Scientific Research Institute of Motion Picture Photography

[Abstract] Electronic and computer techniques are applicable to cinematography in four basic areas: measuring and recording instruments such as densitometers, photographing and film processing hardware, control of process technology and organization, and digital processing of pictures and sound. A new breakthrough since 1975 has been the development of computer-based semiautomatic and automatic control systems for film production, particularly production of color films, already installed in many studios as well as production laboratories and plants. Subject to automation and control with attendant optimization are camera movements, development of negatives, printing and duplicating of positives, image toning, image correction and image transformation. Among the problems yet to be solved are color correspondence and image compatibility with the background achievable by automatic superposition. An adequately performing image input-output system is required here to ensure high-quality pictures. References 40: 34 Russian, 6 Western.
[69-2415]

USSR

BARS-1 [UNIT FOR AUTOMATIC REGULATION OF PEAK-TO-PEAK VIDEO SIGNAL AMPLITUDE]

Moscow VESTNIK SVYAZI in Russian No 10, Oct 79 pp 36-37

OBUKHOVICH, V. G., head engineer, and SIDYAKOV, A. G., engineer, Scientific Research Institute of Radio

[Abstract] The BARS-1 unit for automatic regulation of peak-to-peak video signal amplitude was developed by the Scientific Research Institute of Radio in order to eliminate the deterioration of picture quality due to the variations in signal level that produce undermodulation and overmodulation of the transmitted signal. This device automatically stabilizes signal amplitude within ± 2 percent of the nominal value of 1 V with an input signal range of 0.7-1.5 V The time for settling of the nominal level is 1-1.5 s in the case of an increase in the signal from 0.7 to 1.5 V, and 6-8 s with a reduction in signal level from 1.5 to 0.7 V. Figures 4.
[63-6610]

USSR UDC 523.164.3/.4.001.4

STUDY OF THE STABILITY OF PERIODS OF RADIO RADIATION OF PULSARS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 73-74

SHABANOVA, T. V., IL'IN, V. G., ILYASOV, YU. P., IVANOVA, YU. D., KUZ'MIN, A. D., PALIY, G. N. and SHITOV, YU. P.

[Abstract] A general description of the characteristics of the radio radiation of pulsars is presented. The magnetic field of the interstellar plasma and the terrestrial ionisphere has been found to have a significant influence on the stability of the mean form of the pulses of radiation received from pulsars. Pulsar radiation is highly linearly polarized. The influence of the ionisphere can be greatly reduced or even eliminated in some cases by multiple-antenna reception. A block diagram is presented of a system developed at the Radio Astonomy Station of the Institute of Physics, USSR Academy of Sciences for this purpose. Observations using this multiple antenna system have been performed for about a half year. Analysis of the data obtained to date indicate that the period of a pulsar can be measured with an error of 1-5 ns over a period of 1 day, with an error of about 0.5 ns over a period of 10 days. [55-6508]

USSR UDC 621.39.08:529.781

VARIATION AMONG CHARACTERISTICS OF INSTABILITY OF THE DELAY OF SIGNALS IN ELECTRIC COMMUNICATION CHANNELS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 20-21

CHERENKOV, G. T.

[Abstract] The error introduced by communication channels during transmission of standard time and frequency signals is determined by estimating the variation in delay of the signals and the relative variation in frequency, by means of the Allen dispersion which characterizes the mean square variation in delay of the signal in an electric communication channel over a given time interval, and can be used as a measure of the error introduced by the channel. Values are calculated for the index ϵ, defined from the characteristics of instability of various communication channels in the low frequency range, cable and radio relay lines, television broadcast networks, etc. The observed variation of ϵ allows simplification of the equations used for calculation of the Allen dispersion. References 8: 2 Russian, 6 Western.
[55-6508]

USSR UDC 621.391.2

SELECTION OF PAIRS OF A PERIODICALLY PHASE-KEYED SIGNAL AND FILTER

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 69-70
manuscript received 22 Aug 78

ANTONOV, V. M.

[Abstract] A class of multiphase periodic PK signals of arbitrarily long length is presented, which have no amplitude modulation and for which the side lobes of the aperiodic signal are equal to zero on the time axis. An algorithm is presented for synthesis of a code sequence for a multiphase periodic PK signal of the class found. Tables 1; references 3 (Russian).
[52-6508]

USSR UDC 621.391.2

SPECTRA OF MULTIPHASE SEQUENCES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol. 22 No 9, Sep 79 pp 80-82
manuscript received 6 May 78; after revision 26 Sep 78

IPATOV, V. P.

[Abstract] When it is necessary to resolve periodic signals on the basis of delay over a broad dynamic range, it is natural to consider the ideal periodic correlation function for which all side lobes have zero level over the repetition period. Certain multiphase sequences of roots of unity have periodic correlation functions of this type. This article analyzes their spectra. The amplitude spectra are found to be uniform, as would be expected. The phase spectra, however, contain quadratic components. References 6: 3 Russian, 3 Western.
[52-6508]

USSR UDC 621.391.8

ESTIMATION OF THE MOMENT OF APPEARANCE OF A FLUCTUATING SIGNAL BY AN AUTOMATION WITH A CONTINUOUS SET OF STATES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 78-80,
manuscript received 16 Feb 78; after revision 5 Feb 79

DOLININ, N. A.

[Abstract] An algorithm is presented for estimation of the amount of appearance of a fluctuating signal, utilizing an automation with a continuous set of states. The probability of false alarm defines the rule of selection of thresholds of the automation to determine the moment of appearance of a signal. The probability of missing a signal is not utilized as a design factor, since the quality of operation of the automation is determined by the mean time of delay and its dispersion. Figures 2; references 6 (Russian).
[52-6508]

USSR UDC 621.391.14:519.2

RECOGNITION OF SIGNALS FROM THEIR SPECTRUM IN A NATURAL BASE WITH PRIMARY VILENKIN-KRESTENSON CHARACTERISTICS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 52-55
manuscript received 28 Jul 78

OMEL'CHENKO, V. A. and MATEVITSKIY, YE. O.

[Abstract] A study is made of the recognition of discrete signals based on a spectrum, measured by a digital analyzer. The system of informative characteristics used for signal recognition is made up of the N first eigenvectors ordered on the basis of the maximum eigenvalues. It is optimal from the standpoint of minimization of the number of characteristics for a fixed accuracy of approximation of the initial vector by a vector of lower dimensionality. References 6 (Russian).
[52-6508]

USSR UDC 621.396.43.088:621.397

ERROR IN DETERMINATION OF THE TIME OF TRANSMISSION OF SIGNALS OVER SURFACE LINES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 21-22

FEDOROV, YU. A.

[Abstract] A study is made of the pecularities of several methods for determination of the time of transmission of signals over surface lines as applicable to the experimental system for transmission of time and frequency signals through television channels used in the USSR. The main sources of error in the measurement are the errors in the receiving and recording apparatus at measurement points and the error in calculation of the instant of the time signals during the period of performance of measurements. Analysis of error sources indicates that the error in determination of the time of transmission of signals by the individual element method may be as great as 0.5-0.6 microsecond. A method is presented for calculation of the transmission times through the same system. The performance of regular test measurements to calibrate the calculations can retain the transmission time error within limits of a few tenths of a microsecond. Figures 2; references 4 (Russian).
[55-6508]

USSR UDC 621.397.088:629.783:525

ESTIMATE OF MAIN ERROR COMPONENTS IN DETERMINATION OF TIME OF TRANSMISSION OF SIGNALS THROUGH SATELLITE TELEVISION CHANNELS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 23-24

IVANOVA, YU. D., PALIY, G. N. and KOZARENKO, B. I.

[Abstract] An analysis is presented of one method of determination of the transmission time of signals from the earth to a satellite relay station and back, which does not require the use of orbit-predicting parameters, and allows a significant increase in the accuracy of synchronization. The results of the analysis show that the time of transmission of signals through satellite television channels to points distant from the broadcast source can be determined with an accuracy of a few tenths of a microsecond. Tables 2; references 3 (Russian).
[55-6508]

USSR UDC 656.25:621.316.9:621.395.44

DETERMINATION OF THE ORIGIN AND ELIMINATION OF PULSED NOISE IN HF COMMUNICATION CHANNELS

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 10, 1979 pp 28-30

SHUBINSKIY, A. I., ABLAMSKIY, A. V., engineers

[Abstract] The essence of the method suggested is recording of interference on a high speed strip-chart reporter at certain standardized points in the communication system, including directly from cable conductors. Examples of recordings are presented. The system suggested was used to measure pulsed noise and to determine the locations and causes of formation of the noise on a railroad communication system. Examples are used to note the specific measures used to eliminate pulsed noise in high frequency channels. The examples are not intended to provide exhausting information concerning all possible locations where noise may develop, but rather to point toward directions of possible improvement.
[60-6508]

USSR UDC 656.254.5

DEVELOPMENT OF A DIVISIONAL COMMUNICATION SYSTEM, PART II

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 10, 1979 pp 13-16

ZDOROVTSOV, I. A., Chief, Communication Department, Design Bureau, Main Administration for Signals and Communication, Ministry of Railroads

[Abstract] Part I of this paper appeared in AVTOMATIKA, TELEMEKHANIKA I SVYAZ', 1979, No 9. In Part II a study is made of cable railroad communication lines and transmission systems which allow increased numbers of voice and low frequency communication channels. It is found that effective use of combined voice and low frequency channels can greatly increase the number of channels provided by the existing number of cable lines. Replacement of the K-12+12 system with the K-24T system, a multi-channel transmission system with frequency separation of channels and amplitude modulation, could result in a savings of up to 600 tons of copper per year per system, saving around one million rubles. The K-24T system should be used for divisional communication, the K-60p system for long range communication over the entire railroad. The editors note that the suggestions are preliminary and may be changed in the future.
Figures 3; tables 1.
[60-6508]

USSR UDC 656.254.16

THE ANNOUNCER'S BOOTH OF A RAILROAD STATION PUBLIC ADDRESS SYTEM

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 10, 1979 pp 23-28

SHVETSOV, N. N., engineer

[Abstract] General characteristics are presented for the construction of the announcer's booth from which announcements originate in a railroad station. In order to improve sound quality and reduce noise, it is suggested that the booth be placed on a separate foundation and that sound insulation techniques be used. Diagrams are presented of the separate foundation structure, a design for mounting of studio window glass in rubber gaskets, a design for studio doors containing lead or iron sheets and felt matting to reduce sound transmission, and tables and graphs are presented for determination of the characteristics of announcer's booths.
Figures 7; tables 4.
[60-6508]

USSR

DIGITAL COMMUNICATION SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 1-2

Editorial staff, ELEKTROSVYAZ'

[Abstract] The unified automated communication system with computer control for the Soviet Union has been designed to provide all modes of communication through coordinated use of analog and digital data transmission over cables, radio relays and satellites. The outstanding advantages of digital data transmission systems are high interference immunity, better than that of frequency sharing systems, and the possibility of integrating transmission with switching of signals into one process. Such systems are also characterized by stable electrical parameters, easy inspection on the basis of one error measuring parameter only, easy organization of transit stages without signal degrading, and no need for in-service adjustments. The preliminary hardware basis of these systems are semiconductor devices and microcircuits, with an increasingly higher scale of circuit integration from the second through the third to the fourth generation. The latest fourth generation equipment is suitable for construction of a hierarchical series of ternary and quaternary pulse-code-modulation as well as digital commutation and integral digital communication systems. The editorial staff thanks M. U. Polyak, A. M. Mekkel', Ye. V. Mamonov and E. V. Kordonskiy for the tremendous job in planning, organizing and reviewing the material in issue No 11, Nov 79 of ELEKTROSVYAZ'.
[90-2415]

USSR UDC 621.39:621.376.56

DIGITAL DATA TRANSMISSION SYSTEMS AND OUTLOOK FOR THEIR USE

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 6-13 manuscript received 13 Jun 79

MEKKEL', A. M.

[Abstract] Digital data transmission systems in the Soviet Union and in Europe are classified, according to the nominal rate of transmission of binary signals, into four ranks: primary (2048 kbit/s), secondary (8448 kbit/s), ternary (34,368 kbit/s) and quaternary (139,264 kbit/s). Their main components are tone-frequency channels and analog-to-digital converters,

operating by pulse-code, delta, or adaptive differential pulse-code-modulation. Their main advantages over analog data transmittion systems derive from their superior transmission quality characteristics, broader system design possibilities, better service and maintenance features, a simpler equipment manufacturing technology and easier equipment installation. There is some tradeoff between digital and analog communication systems in terms of frequency channel width and utilization, but direct transmission of digital signals over digital channels without conversion from and to analog signals is always more efficient. The digital communication systems with pulse-code modulation now operating in the Soviet Union include the urban IKM-30 and the rural IKM-12M as well as the high-frequency intrazonal multiquaternary IKM-120. Under development and to be completed during the tenth five-year plan period is, furthermore, the duplex quaternary digital data transmission system IKM-1920. Figures 1; tables 6; references 18: 17 Russian, 1 Western.
[90-2415]

USSR UDC 621.315.233

FIRE RESISTANCE OF ASBESTOS-CEMENT PLATES IN CABLE INSTALLATIONS

Moscow ENERGETIK in Russian No 5, May 79 p 8

OSTROVSKIY, V. V., engineer, Sredaztekhenergo, Tashkent

[Abstract] The article is a report on tests of asbestos-cement partitions 8 mm and 15 mm thick used to separate cables in ducts. The tests were done in cable ducts measuring 2 x 1.8 m. Air was forced through the duct at a rate of 0.5 m/s, and a gas flame was used to ignite the lower row of cables. The time from ignition of the cables to destruction of the partitions was determined. It was found that the 8 mm partitions were destroyed beginning with the lowest within 4 minutes after cable ignition, and then at intervals of about 2 minutes from the bottom upward. The temperature of the burning cables reached 795-1100°C and propagated lengthwise at 180 mm/min. In the case of 15-mm boards, the bottom partition was destroyed within 7.5 minutes, and the remaining partitions failed at 4 minute intervals. The temperature of the burning cables reached 862-980°C and combustion propagated at 130 mm/minute. In all tests, the fire spread rapidly to the next row of cables with destruction of the partition. The installation of asbestos-cement plates is not recommended where automatic foam or sprinkler extinguishing systems are used because of interference with the flow of the extinguishing agent. Figures 1.
[44-6610]

USSR UDC 621.316.3

SPECIFICS OF THE DEVELOPMENT AND INTRODUCTION OF MESSAGE COMMUTATION CENTERS

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 1-3 manuscript received 27 Oct 77

BAZILEVICH, YE. V.

[Abstract] Message commutation centers are now being introduced in the public telegraph system. This is expected to increase the degree of automation of telegram processing by the use of computer facilities, improve the quality of operation of the system of direct connections by reducing the number of switching sections, and improve the efficiency of utilizing main channels. The author discusses the technological algorithm of telegram processing fixed in the program of the message commutation center, the operating reliability of the center and the technical operating system. The distinguishing features of the message commutation center based on computers are control via a stored program, concentration of basic control functions in a central processor, and flexibility due to the extensive possibilities of the stored program. Programmed operation puts more severe demands on the skill of service personnel. The principle of centralized operation makes any errors more dangerous than in decentralized organization. References 2 (Russian).
[61-6610]

USSR UDC 621.317.088:621.317.342

EVALUATION OF ECHO SIGNALS IN THE FEEDER CHANNEL OF THE SPANS OF A RADIO RELAY LINE

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 24-28 manuscript received 8 Dec 78

SMANTSER, A. N.

[Abstract] Echo signals arise in the feeder channels of radio relay lines due to reflections from the inhomogeneities at the points where the feeder channel is connected to the relay equipment and antennas, and also from inhomogeneities within the channel itself. Expressions are considered that relate the amplitude and period of the cosine component of nonuniformity of group delay time in the rf channel to the level of an isolated echo signal, and a formula is derived for calculating the error of measurement of cosine nonuniformity of the group delay time. This measurement error may reach considerable values (several hundred percent), and must be taken into consideration by a special correction factor on long waveguide channels (more than 100 m). Figures 4; references 3 (Russian).
[61-6610]

USSR UDC 621.376.33

FREQUENCY TELEGRAPHY SIGNAL DEMODULATORS BASED ON DIGITAL PHASE AFC RINGS

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 52-55 manuscript received 12 Jun 78

RYNDA, A. I., TYAZHEV, A. I. and SPIRIDONOV, N. A.

[Abstract] The use of phase AFC rings with threshold-lowering properties in demodulators reduced the probability of reception error as compared with incoherent demodulators. The reception error probability is minimized by using phase AFC rings with optimum parameters. In this article formulas are presented for calculating the optimum parameters of phase AFC rings based on digital circuits. Descriptions are given of the working principles of frequency telegraphy demodulators based on digital phase AFC rings of first and second order, and block diagrams of the demodulators are presented. The demodulator that is selected for practical use will depend on the selectivity of the channel preceding the demodulator, and on the attainable stability of the synchrolock frequency and the clock pulse rate. The proposed circuits are simple and require almost no alignment, there are no analog components and adjustment is simple when detecting signals with different deviations. Figures 3; references 3 (Russian).
[61-6610]

USSR UDC 621.376.56.001.4:621.391.1.037.372

ON-LINE TESTING OF AN IKM-120 SECONDARY DIGITAL DATA TRANSMISSION SYSTEM WITH PULSE-CODE MODULATION

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 18-25 manuscript received 19 Jun 79

GRINSHTEYN, D. A.

[Abstract] A 120 km long pilot line has been designed and built for testing of IKM-120 secondary (8448 kbit/s) digital data transmission equipment with a 4x4x1.2 MKSSTShP cable. The tests had been programmed for checking all transmission quality and equipment performance indicators relative to standard requirements. Both d.c. and a.c. measurements were made where appropriate. The components thus tested were line channel and time grouping equipment as well as analog-to-digital and digital-to-analog converters for transmission systems with frequency sharing of channels.

At the same time the feasibility was also investigated of using symmetric cables for higher frequency bands than is possible in analog data transmission systems, as well as the feasibility of remote inspection of line channels, of fault signalization, of concurrent operation of several digital channels in one cable, and of coupling analog and digital channels in series through converters for a secondary group of frequency sharing systems in the 312-552 kHz band. Also tested were the immunity of equipment to extraneous effects and the degree of protection. All readings, most importantly those of error levels, were found to be satisfactory and to confirm the anticipated advantages of IKM-120 digital data transmission equipment. Figures 7; references 3 (Russian).
[90-2415]

USSR UDC 621.391:534.871

ADAPTIVE DIFFERENTIAL PULSE-CODE MODULATION WITH LINEAR PREDICTION BASED ON A LADDER FILTER

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 47-52 manuscript received 16 May 79

NAZAROV, M. V. and PONOMAREV, YE. P.

[Abstract] Adaptive differential pulse-code modulation is a highly effective way to discretize speech signals. Here the structure of a single-channel system is shown where the operation consists of subtracting the sequence of predicted values from a sequence of actually arriving speech signals, and transmitting the thus obtained prediction error to the input of an M-level quantizer. Inasmuch as actual speech signals constitute a nonstationary random process with a slowly varying energy spectrum and power, an adaptive filter-predictor yields optimum results. This is demonstrated in the case of a speech signal with partial correlations, where an algorithm of adaptive differential pulse-code modulation using a ladder filter is simple and technically easy to realize. An analysis of processes in the transmitter and in the receiver, with consideration of the signal-to-noise ratio as well as subjective factors, reveals that this method of digital speech transmission tremendously improves the efficacy of standard telephone sets. Figures 5; tables 1; references 11: 6 Russian (one Russian a translation of a Western source); 5 Western.
[90-2415]

USSR UDC 621.391.8

INFLUENCE THAT TEMPORARY REDUCTIONS IN SIGNAL LEVEL HAVE ON THE FIDELITY OF DATA TRANSMISSION WITH CONSIDERATION OF DECOMMUTATION

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 6-8 manuscript received 13 Jul 77

[Abstract] Temporary reductions of signal level that are typical of metallic channels are the main source of error in data transmission. With a reduction in signal level exceeding 17 dB (interruption) lasting more than 300 ms there is a break in the reception of discrete information (decommutation). The author investigates the influence that decommutation has on error probability. It is found that when the signal-to-noise ratio is greater than 18 dB, interruptions in data transmission are the major factor in error probability, and decommutation is effective since it leads to a considerable reduction in error probability. When the signal-to-noise ratio falls below 15 dB, error probability is influenced mainly by reductions in a signal level that do not exceed 17.4 dB, where the ratio of random to nominal signal amplitude is greater than 0.12, and decommutation is ineffective. Figure 1, references 4 (Russian).
[61-6610]

USSR UDC 621.391.24:621.391.1.037.372

ENERGY SPECTRA OF BIPULSE SIGNALS: PART 1

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 43-46 manuscript received 23 Apr 79

POLYAK, L. M.

[Abstract] Bipulse signals are used for digital data transmission between terminals over short-distance urban cables. They feature a high degree of interference immunity, already at a signal-to-noise ratio of 16 dB, and are compatible with zero-voltage threshold devices. Binary signals can be easily converted to bipulse signals and, regardless of their statistical characteristics, the frequency base is always extractable at the receiver end. Here are considered both absolute bipulse signals (+1;-1 for each "1", -1;+1 for each "0") and relative bipulse signals (same as preceding one for a "0", opposite to the preceding one for a "1") as well as bipolar signals with occupied pauses (polarity of a "1" alternating, a "0" transmitted by means of a +1;-1 bipulse). Their energy spectra are analyzed along with the amplitude characteristics depending on the probability p,q of a binary "1" or "0" respectively. The spectrum of absolute bipulse

signals is found to be symmetric with respect to p= 0.5 and to contain, except at p= 0.5, a discrete component in the form of even harmonics in addition to the continuous component. The spectrum of relative bipulse signals is found to be asymmetric with respect to p= 0.5 and not to contain a discrete component at all, becoming at p= 0.5 identical to the spectrum of absolute bipulse signals. The spectrum of bipolar signals with occupied pauses contains a discrete component in the form of odd harmonics at any probability p. Each of these three kinds of bipulse signals affects in a different way and to a different degree the performance of tone channels and that of transmission systems with frequency sharing of channels. Figures 5; references 4 (Russian).
[90-2415]

USSR UDC 621.391.82

POTENTIAL INTERFERENCE IMMUNITY OF SEPARATION OF TWO SIGNALS WITH FREQUENCY MODULATION

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 19-23 manuscript received 8 Jan 79

BYKHOVSKIY, M. A.

[Abstract] The most important problem of radio communications that arose in the twenties and thirties and that is now becoming more acute is the question of increasing the number of radio facilities that operate in a given frequency band with an acceptable level of mutual interference. Especially important is the problem of separating radio signals with frequency modulation occupying a common frequency band. The potential interference immunity of devices for effectively separating two FM signals with overlapping frequency spectra is considered. Theoretical analysis shows that the traffic handling capacity of a frequency-modulated channel could be doubled in demodulators of new designs by satisfying conditions for effective separation of two FM signals. Losses are minimized in signal separation within a common band if the signals are transmitted with a constant phase shift of 90°. Two FM signals with transmission of useful information on subcarriers can be more effectively separated than in systems with direct frequency modulation. If the phase shift between the FM signals to be separated is random and can take on any values, effective separation with minimum losses requires an increase in spacing between carrier frequencies. Nevertheless, optimum demodulators retain their advantages even with considerable frequency spacing since the output noise level of the useful signal is independent of the level of radio interference. Insertion of pilot signals improves conditions of separation of the useful signal and radio interference, and considerably reduces the mutual influences between radio signals with FM working in a common frequency band. Figures 2; references 12: 11 Russian, 1 Western.
[61-6610]

USSR UDC 621.391.837:621.371.222

SOME PARTICULARS OF PROPAGATION OF DECIMETER RADIO WAVES IN A TV BROADCAST NETWORK

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 41-45 manuscript received 29 May 79

SHUR, A. A. and KALININ, YU. M.

[Abstract] The recommendations of the CCIR are used in planning television broadcasting. However, these recommendations do not give enough consideration to certain questions, particularly the attenuation of field strength in large cities and close to the transmitting station, depolarization of waves beyond the limits of direct visibility and so on. This article is one of several that have been written in various nations in an effort to refine and expand the recommendations of the CCIR. An examination is made of the results of experimental studies done on decimeter waves in the European part of the Soviet Union. It is found that field strength is weakly dependent on distance in the zone of reception from the side lobes of a typical TV transmitting antenna, amounting to about 80 dB per kW of radiated power. At a reception antenna height of 10 m in the shadow of urban structures, decimeter waves are attenuated by an average of 28-32 dB. In regions of the city where the density of buildings is high, the experimental curve for the median value of the received field intensity E_m as a function of distance R is about 18 dB lower than the CCIR curve. The signal levels measured on the roofs of buildings in a large city are 12-20 dB higher than the CCIR levels. The curves $E_m(R)$ plotted in the European part of the USSR over various terrains at $R \geqslant 10$ km are about 4-6 dB higher than the curves recommended by the CCIR. Where possible, the antenna in reception areas close to the transmitting antenna should be set up at the point of the interference maximum of the field. In the decimeter band, distortions of the image due to the action of extraneous interference and multiple beams have less effect than in the meter wave band. Figures 9; references 7: 4 Russian, 3 Western. [61-6610]

USSR UDC 621.391.883

EXAMINATION AND SELECTION OF THE CONVERTING SIGNAL FOR A SCRAMBLER

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 52-58 manuscript received 4 Apr 79

MEDOVAR, B. A.

[Abstract] Scrambling of digital signals makes it necessary to convert them, while making it necessary to recover them only at the input of channel and group equipment. Randomization improves the statistical characteristics of digital signals, facilitates their transmission by the simplest code, and reduces their phase jitter. Scrambling a signal to an as nearly random one as possible requires the proper selection of the scrambling sequence. Scramblers with external synchronization are preferable to scramblers with self-synchronization, because of the lower level of error buildup, and here the basic parameters of any digital sequence are examined on the basis of which the optimum pseudorandom one will be selected for such a scrambler. Calculations and measurements indicate that an M-sequence with a period $N=2^{10}-1$ and generated by a polynomial $x^{10}+x^{9}+x^{6}+x+1$ is the most appropriate one. Figures 5; tables 4; references 13: 8 Russian, 5 Western.
[90-2415]

USSR UDC 621.391.883

CONSTRUCTION OF A QUATERNARY DIGITAL DATA TRANSMISSION SYSTEM

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 13-18 manuscript received 24 Jul 79

VETYUGOV, A. I.

[Abstract] All advantages of digital data transmission should be ultimately realizable in the quaternary (139,264 Mbit/s) [sic. = Kbits in previous paper] system, the scientific research on which in the Soviet Union has been completed in 1978. The capacity of such a system is adequate for combining tone-frequency channels with black-and white and color television channels, for operation within the requirements of a unified automated communication network and for practical implementation of any discrete data transmission techniques. Structurally the system includes digital signal flux shaping equipment at terminals, digital line channels and special measurement-inspection devices. There are also provisions

made for interfacing it with an existent analog communication network. The subsequent design must be based on the principle of maximum techno-economic effectiveness, taking into account that digital color television signals are the most sensitive ones to error and phase fluctuations. As a reference for evaluation can serve K-1920 and VLT-1920 systems or a K-3600 system, operating with KMB cables. Figures 2; references 15: 13 Russian, 2 Western.
[90-2415]

USSR UDC 621.394.1

ORGANIZATION OF ALTERNATIVE TRUNKING IN EXISTING CROSSBAR OFFICES

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 3-5 manuscript received 18 May 77

BERSHTEYN, P. V., KOZHEMYAKIN, P. I. and FEDOROVA, N. I.

[Abstract] Considerable emphasis is currently being place on improving the effectiveness of existing telegraph facilities in addition to introducing new hardware. The authors consider ways to improve control of telegraph communications by organizing alternative trunking in existing crossbar offices. Realization of trunking in AT-PS-PD and "Nikola Tesla" stations is described. It is shown that improvement of operation of the telegraph network requires a new system for setting up connections on bypass routing, enabling each of the subgroups of stations connected to the same outgoing multiple trunk to have its own optimum alternative trunking. The proposed organization of the trunking system is realizable in either type of station. Appropriate rules of station design are given for implementation of this system. In accordance with these rules, changes must be made in cross-connections in existing stations. Figures 3, references 4: 2 Russian, 2 Western.
[61-6610]

USSR UDC 621.394.67:621.395.4

A QUINQUENARY BALANCING CODE FOR DIGITAL DATA TRANSMISSION OVER CABLES

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 58-64 manuscript received 23 May 79

SHUVALOV, V. A.

[Abstract] Multilevel line signals with a lower base frequency than that of 2-level line signals are used in digital data transmission systems so as to make it possible to lengthen the regeneration segment of such a system and thus make it more competitive with an analog data transmission system of equal capacity. Here the conversion of a binary signal to non-modular codes for this purpose is shown in a universally applicable manner, such codes not requiring that the decoder at the receiver end be synchronized with the encoder. Specifically a 5-level code of this kind is shown, namely the BK-45 (β = 5, N_0= 7, Q= 3), which yields a well balanced line signal. A preliminary analysis indicates that the error buildup factor in this code does not exceed 10 relative to the original binary signal. The article is dedicated to the memory of the author's father, ANDREY FEDOROVICH SHUVALOV, who worked as an engineer at the radio communication enterprises of the USSR Ministry of Communication over the 1920-72 period. Figures 5; tables 4; references 10: 4 Russian, 6 Western. [90-2415]

USSR UDC 621.395.61

ANALOG-TO-DIGITAL AND DIGITAL-TO-ANALOG CONVERTERS IN A TONE-FREQUENCY CHANNEL WITH DELTA MODULATION

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 38-40 manuscript received 23 Jul 79

GEBERGER, G. KH., KOLYADINA, V. A., PETROVA, M. Z., USHAKOVA, L. V., TSENDEROV, R. I. and SHTEYN, V. M.

[Abstract] An encoder-decoder is basic equipment for an integrated digital communication network with delta modulation, preferable to pulse-code modulation in speech transmission, and is found as a part of every digital telephone set already available in the microminiature version. This equipment with syllable companding and analog-digital modulator control, including a comparator circuit and a signal shaping circuit with feedback, had been tested earlier in a 300-3400 Hz channel. Its performance indicators, namely dependence of the quantization signal-to-noise ratio on the

output signal level and amplitude characteristic as well as the frequency characteristic of the overall attenuation, were measured and all found to be within the ICCTT G.712 specifications. The transmission quality in such a channel was now also measured, particularly the effect of the transmission rate (25.6-51.2 kbit/s) on objective and subjective intelligibility indicators, as reference for comparison serving such a channel without an encoder-decoder and simulations of two local telephone channels. The quality of facsimile signal transmission was, furthermore, measured with the use of "Shtrikh-M" equipment for dash images and "Neva" equipment for semitone images. The authors thank A. K. Grabovskiy, Ye. P. Zayats, B. S. Smolyak, V. M. Stroganov and D. L. Kheyfets for helping with the studies. Figures 4, tables 3; references 9: 5 Russian, 4 Western.
[90-2415]

USSR UDC 621.395.74.001.24

USING ALTERNATE PATHS IN CITY TELEPHONE EXCHANGES

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 29-33 manuscript received 4 Oct 77

YAKOVENKO, N. N.

[Abstract] In most practical cases the use of alternate paths in city telephone exchanges enables better utilization of switching equipment, increased utilization of trunk circuits and eliminates overloading of individual routing. Although the capability for organizing alternate routing is built into all modern switching systems, this capability is not utilized because of the complexity of calculating the number of lines on the bypass route. In this paper a simplified method for doing such calculations is suggested. It is shown that when this engineering method is used, all values of the loads on the direct route and on both sections of the alternate path have a certain maximum negative error that depends on the effective accessibility of the switching circuits and the mathematical expectation of the load to be handled by the bypass. The maximum error can be readily compensated. Figures 5; references 7: 3 Russian, 4 Western.
[61-6610]

USSR UDC 621.395.74.037.37

SOME PROBLEMS IN CONSTRUCTING A DIGITAL COMMUNICATION NETWORK

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 3-6 manuscript received 10 Aug 79

POLYAK, M. U.

[Abstract] Digital data transmission systems are being introduced alongside frequency sharing channels with commutators and mechanical contacts in the Soviet Union as well as in other technically progressive countries. Here some aspects are discussed concerning the structure of such networks and latest design trends. There is a primary network to consider consisting of line channels with a trunk for local and intraurban telephone communication. There is also a secondary network of digital channels, including interurban hookup, for both voice and telegraph communication. One problem here is devising an appropriate dialing system. Another problem is simplifying the peripheral equipment as well as introduction of smaller and more economical hardware. It has, for instance, been possible by installation of analog-to-digital and digital-to-analog converters in telephone sets at sending and receiving ends respectively, to replace complex concentrators with a synchronous integration with primary group traffic. The trend in hardware is, furthermore, toward microcircuits and solid-state components. Figures 1; references 13 (Russian). [90-2415]

USSR UDC 621.395.663.6

OMTA EQUIPMENT FOR INTERCITY PAY TELEPHONES

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 34-38 manuscript received 1 Aug 78

BEREZOVICH, L. A., KLIBANER, B. K., SOSUNOV, G. L. and UZLOV, YE. N.

[Abstract] The Sverdlovsk Affiliate of the Central Design Office of the USSR Ministry of Communications has developed the OMTA intercity pay telephone equipment that is to be installed in regional centers equipped with AMTS-1M and AMTS-3 automatic trunk exchange offices. The OMTA equipment was successfully tested in the Yalta Municipal Technical Production Administration of Communications, and series production was started in 1979. The equipment is designed for organizing outgoing automatic intercity and zonal telephone communications with MTA-15-2 and Tsf AMTS pay

telephones, and also with the telephones of isolated subscribers who create the maximum load on the intercity network. The block diagram of the OMTA equipment is given, and the design of individual modules is described. Preliminary calculations done for an OMTA installation for 80 pay telephones have shown that the annual economic effect compared with existing methods of connecting pay telephones would be 60,000 rubles (750 rubles per telephone). Figures 7; references 5 (Russian).
[61-6610]

USSR UDC 621.395.721:621.395.74.037.372

"TsTA-1" TELEPHONE SET FOR A DIGITAL COMMUNICATION NETWORK

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 35-37 manuscript received 19 Jun 79

ABUGOV, G. P., LUK'YANOV, YU. I., RAKHMAN, A. M., SMOLYAK, B. S. and STROGANOV, V. M.

[Abstract] The most popular device used by subscribers in integrated digital communication networks with delta modulation is the TsTA-1 telephone set, which performs all functions of a conventional telephone set. It is connected either directly to a digital electronic switching station or, if the distance exceeds 300-500 m, to a synchronous concentrator with a symmetric 2-conductor line and a +24±3 V source for remote supply. Logic "0" and "1" signals appear at the set as positive pulses of respectively 2 and 4 microsecond duration. The transmitter and the receiver in such a set are connected to individual subscriber lines through line transformers. The operation is simple and conventional. Figures 3; references 5 (Russian).
[90-2415]

USSR UDC 621.396.4

RECEPTION OF SIGNALS WITH PHASE-DIFFERENCE MODULATION IN OPTICAL CABLE SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 79 pp 17-18 manuscript received 25 Oct 78

BORISOV, E. V. and TOLPAREV, R. G.

[Abstract] In designing and operating optical cable systems with various kinds of modulation, technical difficulties arise due to the need to use sources that produce highly coherent radiation. Such systems generally utilize data transmission methods based on discrete modulation of subcarrier waveforms that are used in turn for intensity modulation of the optical carrier. The authors consider problems of signal reception with phase-difference modulation on a subcarrier frequency in optical cable systems, and determine the interference immunity of such signals. Expressions are derived for calculating the average error probability in signal reception with phase-frequency modulation of subcarrier waveforms. The results can be used in engineering calculations. Figures 3; references 2 (Russian).
[61-6610]

USSR UDC 621.396.41.037.372

ORGANIZATION OF DIGITAL RADIO-RELAY LINE CHANNELS

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 25-28 manuscript received 14 May 75

KAMENSKIY, N. N. and MINKIN, V. M.

[Abstract] For digital data transmission on the basis of radio relaying one can also use, instead of radio relay systems for exclusively digital data transmission, either radio relay systems for analog data transmission with provisions for primary or secondary digital data transmission, or auxiliary telephone or television trunks in analog radio relay systems. While frequency modulation makes most efficient use of analog equipment with redundancy in the first case, phase modulation achieves the maximum possible interference immunity in the second case. Reliable and inexpensive terminal equipment KURS for digital radio relaying compatible with existing analog radio relaying trunks has been developed and tested which features both efficiency and interference immunity. It is ready for installation in intrazonal communication networks. Figures 4; references 5: 4 Russian, 1 Western.
[90-2415]

USSR UDC 621.396.43

'RADAN' DIGITAL RADIO RELAY EQUIPMENT FOR RURAL COMMUNICATION

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 31-35 manuscript received 30 May 79

PEREGONOV, S. A., TARASOV, S. S. and CHERNYY, V. E.

[Abstract] "RADAN" equipment for rural communication consists of an IKM-12MR bay and an IKM microwave pulse-code-modulation transceiver station with a coupling between the transmitter stage and the receiver stage, tunable over a 60 MHz frequency range. The transmitter part includes a 100 mW oscillator with frequency stabilization, a bandpass output filter and a video regenerator. The receiver part includes a bandpass input filter, a balancing mixer, a 25 mW heterodyne with frequency stabilization, an intermediate-frequency amplifier and a video regenerator. The coupling between them includes a circulator and sets of waveguide segments, matching and line transformers, also lightning arresters, commutators, and an interface to the service communication channel. An important part of the microwave transceiver station is also a 39.5 dB AED antenna 100 mm in diameter. In the bay are enclosed auxiliaries and radio channel terminals. The interference immunity of "RADAN" equipment is shown, on the basis of theoretical relations, to be optimum only with perfect matching of filters. This is very difficult, however, in the case of digital microwave radio relaying. Thus even at an error probability of 10^{-6} the interference immunity is here still 3 dB below ideal, and frequency instability reduces it further. These factors need to be considered in the design of digital radio relay lines. Figures 3; references 3: 2 Russian, 1 Western.
[90-2415]

USSR UDC 621.398.9

ENGINEERING DIAGNOSIS OF LINE CHANNELS ON SINGLE-QUAD CABLES

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 41-43 manuscript received 29 Jun 79

BOTVINNIK, A. YE., DAVDOV, S. A. and POLNER, P. B.

[Abstract] Pulse-code modulation on single-quad cables is increasingly used in rural and intrazonal digital telephone networks. Without additional conductors available, it is possible to organize an auxiliary 2- or 4-conductor channel for service communication. A problem here is separation of high-frequency digital signals from low-frequency test signals, which

can be done either by means of low-frequency repeaters or with an artificial transmission line. The latter method is found to be simpler and entirely feasible, with proper coil loading. A system designed according to this principle has rendered a satisfactory performance in engineering diagnosis such as fault detection and location, control signalization, and processing of data about the condition of main equipment. This artificial transmission line has half the resistance and 2.7 times the capacitance of the main line, making the attenuation coefficient 1.16 times higher. This method of engineering diagnosis has been adapted to the IKM-30 rural communication system with pulse-code modulation. Figures 3; references 2 (Russian).
[90-2415]

USSR UDC 621.396.946.2:621.396.6

MULTISTATION-ACCESS WITH TIME MULTIPLEXING EQUIPMENT FOR DIGITAL DATA TRANSMISSION OVER SATELLITES

Moscow ELEKTROSVYAZ' in Russian No 11, Nov 79 pp 29-31 manuscript received 2 Jul 79

PAN'KOV, G. KH., GREBEL'SKIY, M. D., SIMONOV, M. M., TSIRLIN, V. M. and ROZENBAUM, M. I.

[Abstract] Satellite communication systems in operation since 1977 use MDVU-20 multistation-access with time multiplexing equipment, which transmits data at the rate of 20.48 Mbit/s and provides 120 duplex tone-frequency channels between the Central and the Far Eastern regions of the USSR. Digital data are transmitted in two 60-channel groups with frequency sharing. Subsequently a better MDVU-20/40 (20.48/40.96 Mbit/s) version has been developed which provides 480 simplex tone-frequency channels, with direct transmission of digital signals from terminal or other equivalent equipment with analog-to-digital converters. This MDVU-20/40 system includes, in addition to terminal equipment, a 2- or 4-phase modem and time companders as well as automated redundancy. Figures 1; references 1 (Western).
[90-2415]

USSR UDC 625.151.6:621.396.6

PROCESSING OF ADVISORY INFORMATION IN LOCOMOTIVE RADIO SIGNALIZATION DEVICES

Moscow AVTOMATIKA TELEMEKHANIKA I SVYAZ' in Russian No 12, Dec 79 pp 10-13

FEDOROVSKIY, V. V., candidate in technical sciences, Director of laboratory at the Kiev Institute of Automation; BURATOV, G. N., group leader and BESHENKOV, B. A., senior engineer

[Abstract] Railroad communication includes transmission of advisory information from devices installed on the ground and its reception by devices installed in locomotives. Here locomotive radio signalization for the purpose of informing about control objects is described where on-ground equipment automatically generates a coded signal upon receiving a command from a remote point. That signal, carrying information about the latest condition of a control object, is generated in data-array circuits and transmitted through an antenna into the air. It is received and stored by appropriate circuits in a locomotive for indication on a display panel. The circuits are extensively transistorized, except for irreplaceable electromagnetic and mechanical components. Figures 3. [94-2415]

USSR UDC 656.25:621.396.44

USE OF REGENERATIVE TRANSLATIONS FOR IMPROVING THE QUALITY OF SHORT-WAVE CHANNELS

Moscow AVTOMATIKA TELEMEKHANIKA I SVYAZ' in Russian No 12, Dec 79 pp 7-9

ZHUKOV, YE. V., candidate in technical sciences, Senior engineer at the Central Communication Station of the USSR Ministry of Railroads, KRASKOVSKIY, A. YE., candidate in technical sciences, Acting Lecturer at the Leningrad Institute of Railroad Engineers and LIPOVETSKIY, YU. A., graduate student

[Abstract] Experience shows that the error probability in communication transmitted over short-wave channels of railroad systems reaches 10^{-4} in the best case and can be worse during autumn and winter nights. This poor transmission quality is generally due to the inherent characteristics of radiowave propagation. An effective method of improving the situation is the use of regenerators capable of correctly identifying "1" and "0" signals in each elementary message and forming appropriate telegraph

signals without distortion. Synchronous identification consists of first determining the message boundaries with a cadence synchronizer and then deciding the sign of each received elementary message in a register. The synchronizer components include a boundary discriminator, a phase discriminator, an averager, a cadence-frequency generator and a reference regenerator. The register can operate by the strobing method or by the integrating method, also by a combination of both methods. The averaging coefficient must on the one hand by high for a sufficient interference immunity and on the other hand be low for synphasing during shifts of message boundaries. This contradiction has been resolved at the Department of Radio Communication at the Leningrad Institute of Railroad Engineers. The phase of a telegraph signal is tracked at two different rates and, furthermore, the phase of cadence-frequency pulses is measured not relative to each boundary of a telegraph message but relative only to the boundaries lying within a special time zone established by the cadence-frequency reference signal. This represents an improvement over "Struna" and "Kvarts" as well as radio channel multiplexing regenerators now in use. Figures 3.
[94-2415]

USSR

CALCULATING THE OPTIMUM NUMBER OF CHANNELS ON A TRUNK ROUTE

Moscow VESTNIK SVYAZI in Russian No 10, Oct 79 pp 29-30

AGAPOV, G. V., senior instructor, Leningrad Electrical Engineering Institute of Communications imeni Professor M. A. Bonch-Bruyevich, IOKHVIN, B. M., senior engineer, and PEVTSOV, N. V., chief engineer, Leningrad Intercity Telephone System

[Abstract] In automating intercity telephone connections it is rather complicated to determine the optimum number of channels on individual communication trunks because of the re-ring trafffic that creates an added nonproductive load that affects the final losses and the average answering interval. Conventional mathematical models of telephone networks with re-rings are inadequate for solving this problem because the function of caller persistence is arbitrary. This paper gives formulas for lost calls, the probability of final losses, the average number of calls made before establishing a connection (caller persistence) and the number of attempts of a caller in establishing one connection. These parameters are determined in terms of measurable quantities: number of primary calls, number of re-rings, number of completed calls. Figures 1; tables 2.
[63-6610]

USSR

CHECKING THE OPERATION OF A HOT RESERVE SYSTEM ON WORKING RADIO RELAY LINES

Moscow VESTNIK SVYAZI in Russian No 10, Oct 79 pp 30-32

ZHEREBTSOV, A. L., chief of a laboratory at the Scientific Research Institute of Radio

[Abstract] In adjusting the equipment on radio relay lines and in upkeep and certification work the stability of the hot reserve system must be checked in the presence of fading. The author proposes a method of using artificial fading for this purpose. This technique enables determination of the degree of readiness of the system for providing uninterrupted data transmission, evaluation of the actual depth of fading, and verification of agreement between certain parameters at the equipment and technical specifications. Among these parameters are the output power of transmitters, the noise factor and gain of the i-f channels of the receiver, thresholds of activation and deactivation of the standby generator, pilot signal levels in the terminal bays, operating thresholds of pilot signal and emergency signal receivers, and the diagram of levels in the emergency signal channels. The method of inserting artificial fading consists in using a variable matched attenuator to reduce the signal power at the transmitter output or receiver input from the rated level to the level where the system goes on standby. Figures 3.
[63-6610]

USSR

CABLE EMERGENCY REPAIR STATION

Moscow VESTNIK SVYAZI in Russian No 10, Oct 79 pp 46-48

KUSHNIRCHUK, G. T., accident prevention engineer, Territorial Center for Management of Nation-Wide Communication Services and Television [TTsUMS-3], and SIGALOV, V. Z., Deputy Chief of TTsUMS-23

[Abstract] A description of the KARS truck-mounted cable emergency repair station. The unit is designed for making emergency repairs on symmetric, coaxial and low-frequency cables either buried in the ground or in cable ducts, as well as for planned upkeep and maintenance. A floor plan view is given of the repair shop. Power supply is from an AB-4 T/230 M-1 gasoline generator. The working facilities include a power switchboard, a VSA-6 rectifier, a storage battery, a motor-driven pump with access from the outside, two electric hammers a hand-cranked blower, a crosscut saw, axes, and a cable box with access from inside the repair station. There is a mobile transceiver and an electronic measurement bench. Figures 5.
[63-6610]

USSR UDC 621.372.8

PECULARITIES OF THE PROPAGATION OF SYMMETRICAL E WAVES IN A CIRCULAR TWO-LAYERED SHIELDED WAVEGUIDE WITH A RESISTIVE FILM

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 29-32
manuscript received 10 Mar 78; after revision 27 Nov 78

GORYACHEV, YU. A., KALMYK, V. A. and RAYEVSKIY, S. B.

[Abstract] Waveguides with resistive films are essentially heterogeneous in cross section. This article determines the conditions under which the method of surface current can be used to compose the dispersion equations for multilayer waveguides with resistive films. This is done by analyzing the transmission of a plane wave with arbitrary polarization through a resistive plate of arbitrary thickness. Specific features characteristic of all symmetrical E waves are defined. Figures 3; tables 1; references 8 (Russian).
[52-6508]

USSR UDC 621.372.825

ASYMPTOTIC METHOD OF DESIGN OF CORRUGATED WAVEGUIDES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 38-41
manuscript received 17 Jul 78

KOLOMOYTSEV, F. I., BARTASHEVSKIY, YE. L. and BORUL'KO, V. F.

[Abstract] A study is made of the method of determining the electromagnetic field in weakly nonregulated waveguides with impedance walls, based on the ideas of the asymptotic methods of nonlinear mechanics. The solution for the electromagnetic field is sought through the electric and magnetic Hertz vector potentials, which have only longitudinal components. The applicability of the method is not limited to sine waves alone. It can also be used to analyze other periodic and near-periodic boundary perturbations. The method analyzed can also be extended to the case of a slight perturbation of the parameters of the medium filling the waveguide. Figures 1; references 7: 5 Russian, 2 Western.
[52-6508]

USSR UDC 621.3.002.5.061.4

AN INTERNATIONAL EXHIBITION OF TECHNOLOGICAL EQUIPMENT FOR THE ELECTRICAL ENGINEERING INDUSTRY

Moscow ELEKTROTEKHNIKA in Russian No 10, Oct 79 pp 46-47

GRISHIN, V. F. and SOKOLOVSKIY, S. M., engineers

[Abstract] A special international exhibition "Technological Equipment for the Manufacture of Electrical Engineering Products" - "Electrical Technology 80" will be held in Moscow 15-24 October 1980. It is being organized by the USSR Chamber of Commerce and Industry, at the instigation of the USSR Ministry of the Electrical Equipment Industry, for the purpose of establishing business contacts with leading foreign firms and thus promote import-export trade. The domestic industry will thus become familiar with the latest foreign manufacturing equipment and techniques, while exhibiting its own. The categories of equipment will include machines, tools, tanks, furnaces used for the manufacture of electrical machines, current sources, cables, capacitors and semiconductor devices, printed-circuit boards, and electrical insulation materials. There will also be included equipment for mechanization as well as automation and control of manufacturing processes, especially the assembly of power and communication apparatus. Exhibits will be supplemented with lectures and films. Experts will be available for consultation on technical and commercial matters, as will be facilities for business negotiations and press conferences. A complete catalog will be published.
[78-2415]

USSR UDC 62-505.5:62-83

METHODS OF DESIGNING OPTIMAL CONTROLS FOR A D.C. ELECTROMAGNETIC DRIVE

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 10, Oct 79 pp 173-186
manuscript received 20 Mar 78

CHERKASHIN, A. YU., Moscow

[Abstract] Technical realizations of optimal control for d.c. electromagnetic drives (electromechanical devices with movable components) are surveyed, assuming that deviation amplitudes as well as the number and the lengths of control intervals have been a priori specified. These three control parameters are related to the drive design and performance characteristics so as to produce various laws of optimal control, which can be unipolar or bipolar. The latter provides better speed and braking characteristics, it is also possible to include both in a universal system. The design of control devices is based either on the parametric principle and they then include a master generator and a master timer as well as logic (NOR), or on the compensation principle and they then include a feedback transducer and a pulse-width modulator as well as a comparator and a reference-signal generator. Plain parametric devices are simplest but also subject to destabilizing influences and, therefore, augmented with feedback and compensation. Here the structure and the operation of five different devices for optimal control of neutral or polarized d.c. electromagnetic drives are examined: unipolar control with two voltage supplies (one forcing and one holding) is series or parallel, bipolar control with three voltage supplies (two forcing and one holding) in parallel, bridge control with one voltage supply (forcing) and analog or discrete holding. The advantages and the drawbacks of each are pointed out. Figures 5; tables 1; references 17 (Russian).
[57-2415]

USSR UDC 621.314.57

REDUCING THE EFFECTS OF FAULT CURRENTS ON HIGH-VOLTAGE CONVERTERS

Minsk IZV. VUZ: ENERGETIKA in Russian No 8, Aug 79 pp 30-34 manuscript received 21 Nov 78

KOCHKIN, V. I., candidate in technical sciences, Scientific Research Institute of Direct Current, Moscow branch

[Abstract] Modern high-voltage converters are built with thyristors, the number of parallel branches being determined by the design current and the number of devices in series per branch being determined by the design voltage. Design current is usually regarded as the inrush current due to a 2-phase short circuit which results from an insulation breakdown during thyristor turn-off and whose magnitude depends on the control angle. Here a method of reducing the effect of such a fault current on the converter is proposed which makes use of the converter automation equipment. In effect a 2-phase short circuit at angle $\alpha \approx 0$ becomes a 3-phase short circuit, as the third thyristor in the given group is shorted by a shunting device. Simultaneously or earlier the control pulses to the entire converter are blocked so that the breaker on the line side of the transformer trips and the current in the already fired thyristor drops. The process is analyzed through the three intervals of transition from a 2-phase through a 3-phase and back to a 2-phase short circuit. Calculations show that in this way the inrush current in the third thyristor has been reduced by 20 percent and its ON time shortened from 360 to 263 electrical degrees. These results should be useful for the selection and operation of thyristor converters with protective controlled dischargers. Figures 4; tables 1; references 3 (Russian).
[68-2415]

USSR UDC 621.314.632.4.001.4

RECTIFIERS FOR PERIODIC CHARGING OF STORAGE CAPACITORS

Moscow ELEKTROTEKHNIKA in Russian No 10, Oct 79 pp 25-28 manuscript received 17 May 78

KRASNOPOL'SKIY, A. YE., LEBEDEV, L. F. and SOKOLOV, V. B., candidates in technical sciences

[Abstract] Two multiple-circuit rectifiers are described which, when installed with storage capacitors, almost fully compensate the total reactive power during the entire charge cycle without letting the efficiency

drop below 80-85 percent. Their design is based on phase splitting with either magnetic or electric coupling between the circuits. Their performance analysis is based on the differential equation of state under quasi-steady conditions for the simplified equivalent circuit with respectively an inductive or an inductive-capacitive limiter on the a.c. side. Rectification without and with current cutoff during a half-period is considered. The effectiveness of the charging process is evaluated in terms of power factor, efficiency and load factor during the cycle, with the charging time and the cutoff frequency also taken into account. The performance characteristics in terms of relevant average and rms voltages and currents as functions of the peak capacitor voltage, referred to the peak source voltage, indicate the advantages of phase splitting. Figures 5; references 3 (Russian).
[78-2415]

USSR UDC 621.317.39:531.717.2.001.24

COMPUTER-AIDED DESIGN OF TRANSFORMER-TYPE DISPLACEMENT TRANSDUCERS

Moscow ELEKTROTEKHNIKA in Russian No 10, Oct 79 pp 37-38 manuscript received 17 Jul 78

ASTASHEVSKAYA, T. S., engineer

[Abstract] Design calculations for transformer-type displacement transducers are shown, organized for optimization of parameters by numerical iteration on a computer. The input data are: total package volume; supply voltage and frequency; initial gap and maximum armature travel; load impedance; allowable temperature rise in relation to power losses and cooling surface area; steel and copper (wire) grades and sizes; and maximum allowable magnetic induction in the iron. The design parameters are expressed as functions of the fewest possible independent variables. The procedure is demonstrated on a device consisting of two single transducer windings in a core with coils connected into a differential scheme. Theoretical and experimental performance data of such transducers built on the basis of this design procedure were found to differ by not more than 20 percent. Figures 1; references 3 (Russian).
[78-2415]

USSR UDC 621.317.333.6:620.193.5

PERFORMANCE OF ELECTRICAL INSULATION SYSTEMS IN WATER VAPOR

Moscow ELEKTROTEKHNIKA in Russian No 10, Oct 79 pp 41-43 manuscript received 15 Jan 79

GALUSHKO, A. I., candidate in technical sciences and ET'YEMEZ, N. A., engineer

[Abstract] Several electrical insulation systems and materials were tested for suitability in immersible machines or in machines with evaporation cooling. They included LETSAR (and RETSAR) self-adhesive tape (0.2 mm thick) with KLT-30 organosilicon compound (0.1-0.5 mm thick) and EP-514 epoxide compound (0.1-0.5 mm thick), also polyimide and fluorocarbon as well as double polyimide-fluorocarbon films. Stator windings were insulated with them and held for various lengths of time up to 32,000 h in a steam chamber containing water at the boiling point. The insulation resistance and the breakdown voltage were measured at intervals. The reliability of insulation was evaluated statistically in terms of the probability of an insulation on a coil of n turns not breaking down at a given test voltage (2 kV), with the lower limit of the breakdown voltage and the upper limit of the standard deviation also included in the calculation. Generally the insulation life was found to be longer at lower vapor temperatures and shorter on bent than on straight coil segments. While LETSAR tape was found to lose its self-adhesiveness after 2000 h at 100°C, fluorocarbon and polyimide-fluorocarbon films were found to last for 20,000 h in steam at 100°C. Tables 2; references 3 (Russian). [78-2415]

USSR UDC 550.383

LONGITUDINAL FIELDS AND CURRENTS IN THE EVENING SECTOR OF THE AURORAL MAGNETOSPHERE

Moscow GEOMAGNETISM i AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79
pp 871-876 manuscript received 12 May 78

ANTONOVA, YE. YE., Moscow State University, Institute of Nuclear Physics

[Abstract] The most complete information concerning the global structure and configuration of longitudinal currents at about 800 km altitude was obtained by processing indications of the magnetometer-abroad the "Triad" satellite. These longitudinal currents, as well as the distribution of electrons and ions by energies and pitch angles, are analyzed for this altitude range. A number of characteristic pecularities of phenomena in the evening sector of the magnetosphere are revealed. The most important of these is the constant existence of a band approximately 200 km wide and several thousands of km in length in which a longitudinal flow with a density of $0.4\text{-}2 \cdot 10^{-6}$ A/m^2 is present. Two subsequent articles will present more detailed study of the processes involved. References 23: 2 Russian, 21 Western.
[41-6508]

USSR UDC 550.388.2

TRANSIENT PROCESSES IN AN IONISPHERIC PLASMA ARISING IN THE FIELD OF A POWERFUL STANDING RADIO WAVE

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79
pp 806-811 manuscript received 5 Jun 78

BORISOV, N. D. and VARSHAVSKIY, I. I., Institute of Terrestrial Magnetism, the Ionisphere and the Propagation of Radio Waves, USSR Academy of Sciences

[Abstract] An electromagnetic wave with a fixed frequency between the gyrofrequency of electrons and the critical frequency of a flat layer of a heterogeneous plasma strikes the plasma layer at a right angle. This article studies the transient processes related to the interaction between powerful radio frequency radiation and such a plasma. The results relate to the case of excitation of waves in a strongly ionized, near-collisionless plasma such as the F layer. If the point of reflection of the powerful radio wave varies in height and enters an area with significantly different plasma parameters, the nature of excitation of the plasma and its transient processes may change significantly. The present article studies this problem. The authors thank A. V. Gurevich for helpful discussions. Figures 2; tables 2; references 11: 10 Russian, 1 Western.
[41-6508]

USSR UDC 550.388.2

DOPPLER SHIFT OF THE FREQUENCY OF A RADIO SIGNAL IN A MEDIUM WITH SMALL HORIZONTAL HETEROGENEITY

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79
pp 824-829 manuscript received 20 Jul 78

BOLDOVSKAYA, I. G. and STAKHANOV, I. P., Institute of Terrestrial Magnetism, the Ionisphere and the Propagation of Radio Waves, USSR Academy of Sciences

[Abstract] An equation is derived for the Doppler shift in a medium with small horizontal heterogeneity, when the horizontal gradients of the index of refraction are small in comparison to the vertical gradients (which is usually the case in the ionisphere). The variation in Doppler frequency shift is found to be nonlinear; one of the terms produced by horizontal heterogeneity increases with frequency more rapidly than the Doppler shift in a homogeneous medium. References 3: 2 Russian, 1 Western. [41-6508]

USSR UDC 550.388.2

INTERACTION OF DECAMETER RADIO WAVES AT FREQUENCIES CLOSE TO THE F2 MAXIMUM USABLE FREQUENCY WITH INCLINED PROPAGATION

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79
pp 830-833 manuscript received 27 Dec 78

BOCHKAREV, G. S., KIM, V. YU., LOBACHEVSKIY, L. A., LYANNOY, B. YE., MIGULIN, V. V., SERGEYENKO, O. S. and CHERKASHIN, YU. N., Institute of Terrestrial Magnetism, the Ionisphere and the Propagation of Radio Waves, USSR Academy of Sciences

[Abstract] In the summer of 1976, the authors performed an experimental study of the interaction of a powerful radio wave with a weaker wave when the radiation frequency and geometry of distribution of the fields of the powerful and weak waves were similar in space. Observations of the variations in the parameters of mode 1F2 were performed for 56 experimental runs. Average realization were calculated. It was found that the amplitude of the test signal approximately doubled within 10-20 seconds after the powerful transmitter was switched off, then decreased after about 130 s, without reaching the level corresponding to the period when the

powerful transmitter was switched on. It is concluded that inclined propagation of a powerful radio wave at a frequency close to the maximum usable frequency of the F2 layer results in nonresonant changes (perturbation) of the parameters of the ionispheric plasma. The authors thank N. P. Ben'kov, A. V. Gurevich, I. S. Shluger, Yu. K. Kalinin, Ye. Ye. Tsedilin, Ye. A. Benediktov, V. V. Vas'kov, N. A. Mityakov and A. V. Popov for discussion of the work. Figures 3; references 12: 10 Russian, 2 Western.
[41-6508]

USSR UDC 550.388.2

ANALYSIS OF THE CONDITIONS OF PROPAGATION OF DECAMETER RADIO WAVES OVER A LONG PATH BY AN ADIABATIC METHOD AT A FIXED FREQUENCY. II

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79 pp 834-839 manuscript received 12 Dec 78

LOBACHEVSKIY, L. A., SUARES, KH. B., TUSHENTSOVA, I. A., FISHCHUK, D. I. and TSEDILINA, YE. YE., Institute of Terrestrial Magnetism, the Ionisphere and the Propagation of Radio Waves, USSR Academy of Sciences, Institute of Geophysics and Astronomy, Academy of Sciences, Republic of Cuba

[Abstract] This work is a continuation of an earlier work (L. A. Lobachevskiy, Kh. B. Suares, I. A. Tushentsova, D. I. Fishchuk and Ye. Ye. Tsediline, GEOMAGNETISM I AERONOMIYA, 1979, Vol 19, 474). Using detailed calculations of the parameters of ionispheric wave channels by levels of adjusted dielectric constant ε', a method is given for determination of these parameters for a frequency of 10 MHz.: angles of capture and release, absorption, and the number of oscillations and modes in each communication channel are studied over the long distance communication link between Nikolayev and Havana. The method of calculation of the angles of radiation, absorption and number of modes for each communication channel in the link are presented. The error of the calculation is estimated. Figures 4; references 4 (Russian).
[41-6508]

USSR UDC 550.388.2

CHARACTERISTICS OF SELECTIVE PROPERTIES OF SW RADIO CHANNELS IN THE HIGH LATITUDES

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79 pp 840-845 manuscript received 12 Jun 78

BLAGOVESHCHENSKIY, D. V., KURCHENKO, YU. A. and KONSTANTINOV, A. A., Siberian Institute of Terrestrial Magnetism, the Ionisphere and Propagation of Radio Waves, Siberian Affiliate, USSR Academy of Sciences

[Abstract] Eight types of SW channels are distinguished on the basis of selective characteristics: time, frequency and space. The selective characteristics are studied with respect to time and space, frequency and space, and time and frequency. This problem has two aspects: analysis of the selective properties of ionispheric radio channels for more than one parameter simultaneously; and the significant problem of factoring a multi-parameter correlation function on the basis of individual parameters. Figures 3; references 11: 9 Russian, 2 Western.
[41-6508]

USSR UDC 550.388.2

THE RESPONSE OF THE IONISPHERE TO SUDDEN SWITCHING ON OF A SURFACE VERTICAL MAGNETIC DIPOLE

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79 pp 846-850 manuscript received 12 Jun 78

ARYKOV, A. A. and MAL'TSEV, YU. P., Polar Geophysics Institute, Kola Affiliate, USSR Academy of Sciences

[Abstract] A study is made of the case of a pulse source of superlow frequency signals. The model of the ionisphere is simplified so that the results produced can be expressed analytically and clearly interpreted. An equation is derived which describes the field of the dipole appearing at the moment the terrestrial source is switched on at an elevation such that it is a mirror field with respect to the bottom edge of the ionisphere. The dipole moments of the initial and reflected dipoles are equal in magnitude but opposite in size. Switching off of the terrestrial source is equivalent to switching on of a dipole moment of the opposite sign. The reflected dipole begins moving vertically upward as soon as it is created. In the day, the rate of movement is about 40 km/s, at night - about 800 km/s. The authors are grateful to Yu. A. Dreyzin, S. V. Leont'yev and V. B. Lyatskom for helpful discussions. References 5: 3 Russian, 2 Western.
[41-6508]

USSR UDC 550.388.2

RADIATION OF ACOUSTICAL-GRAVITATIONAL WAVES BY HORIZONTALLY MOVING SOURCES

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79 pp 851-858 manuscript received 29 Aug 78

GRIGOR'EV, G. I., SAVINA, O. N., Gor'kiy State University

[Abstract] A study is made of the radiation of acoustical-gravitational waves by sources of mass q, energy h and momentum F, moving at a constant horizontal velocity in an isothermal unlimited atmosphere. The infrasonic waves generated by moving arcs of the aurora borealis are studied as an example. Figures 4, references 11: 5 Russian, 6 Western.
[41-6508]

USSR UDC 551.510.536

STUDY OF ELECTRIC FIELDS IN THE AREA NEAR A ROCKET UPON INJECTION OF AN ELECTRON BEAM FROM THE ROCKET

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79 pp 812-816 manuscript received 22 Sep 78

ZHULIN, I. A., KOPAYEV, I. M., KOSHELETS, T. YE. and MOSKALENKO, A. M., Institute of Terrestrial Magnetism, the Ionisphere and Propagation of Radio Waves, USSR Academy of Sciences

[Abstract] The first Soviet experiment on injection of electron beams into the ionisphere and magnetosphere of the earth, conducted aboard the Soviet experimental spacecraft "Zarnitsa-1" revealed a glow near the rocket, indicating that compensation at the altitudes studied (90-150 km) is achieved by increasing the concentration of the electrons in the discharge near the rocket. A second experiment, "Zarnitsa-2" yielded the following results: concentration of electrons at 7 m from the rocket at least 10^6 cm^{-3}; concentration of electrons in wake of rocket several orders of magnitude lower. Graphs show the trajectory of flight of the rocket and the measured drop in potential at a distance of 7 m from the rocket. The results of measurement of electric fields thus confirmed the hypothesis of ignition of a discharge near the rocket; the primary contribution to the concentration current is that of ionization of neutrals by the electrons in the ionisphere, accelerated in the electric field of the rocket. Figures 5; tables 1; references 8: 6 Russian, 2 Western.
[41-6508]

USSR UDC 551.510.536

A MODEL OF THE DIURNAL VARIATIONS OF PARAMETERS OF THE THERMOSPHERE. II. RESULTS OF CALCULATION

Moscow GEOMAGNETISM I AERONOMIYA in Russian Vol 19 No 5, Sep/Oct 79
pp 859-864 manuscript received 10 Jul 78

GLUSHAKOV, M. L., DUL'KIN, V. N., IVANOVSKIY, A. I., Central Aerologic Observatory, State Committee for Hydrology and Meteorology

[Abstract] Part I of this series presented equations describing the oscillations of parameters of the thermosphere in a linear approximation, discussed the basic assumptions and presented a method and system of solution of these equations. This article discusses the results of numerical calculations performed using the system, ignoring the influence of the electric field of polarization for the conditions at the equinox and the minimum of solar activity. The calculations show that during the period of the equinox in the thermosphere throughout the entire range of altitudes studied (90-250 km), the diurnal mode of oscillations predominates. The influence of temperature, pressure, wind and lower edge conditions is considered. Figures 4; references 22: 5 Russian, 17 Western. [41-6508]

USSR UDC 621.385.6

SYNTHESIS OF THE GENERAL STRUCTURE OF LOW POWER MICROWAVE ELECTRON VACUUM DEVICES BY THE METHOD OF EQUIVALENT LINEARIZATION

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 61-67
manuscript received 6 Feb 78; after revision 30 Oct 78

BOBROVSKIY, YU. L.

[Abstract] In contrast to low-frequency integrated circuits (IC), where the very same devices can be used as amplifiers, resistors, capacitors, etc. with no deterioration of circuit characteristics, microwave IC require a number of different devices. Qualitatively new operating modes and geometries of planned devices often make the use of common methods of conversion and modeling of parameters inapplicable. One solution to this problem is the development of a model of the generalized structure of electronic vacuum devices, suitable for description of various devices, and creation of an algorithm for the synthesis of such a generalized structure. The problem of synthesis of low-power microwave vacuum devices is analyzed in this work. The method is but a first approximation of the task of planning of a generalized structure but the experience gained in planning a number of low-voltage vacuum tube devices has been positive. References 19: 18 Russian, 1 Western.
[52-6508]

USSR UDC 621.385.6.001.2

CALCULATION OF THE TEMPERATURE FIELD OF THE HELIX IN A TRAVELING-WAVE TUBE WITH CIRCULAR SUPPORT RODS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 99-104
manuscript received 10 Apr 78; after revision 16 Sep 78

BORISENKO, V. D. and RAPOPORT, G. N.

[Abstract] Circular dielectric rods are used for both supporting the helix in a traveling-wave tube and carrying away the heat from it. Here the temperature at the hot spots of such a helix is calculated from the Laplace equation of steady-state heat conduction, taking into account the periodicity of the helical structure as well as the temperature dependence of the thermal conductivity of the rod material. The equation is solved for appropriate boundary conditions at the free surface of rods, at their contact with the helix, and at their soldered connections to the externally cooled envelope. The solution yields expressions and curves for determining the maximum temperature as function of the geometry, at any given

power dissipation level, and thus also indicating how this temperature can be lowered by design. The earlier used approximation of a "smooth" retarding system is found to become invalid in the case of support rods with a diameter smaller than the helix pitch. Numerical calculations for beryllium oxide, a typical rod material, indicate that optimally only 15-25 percent of the helix wire should be removed by grinding to accommodate the supports. Figures 5; references 3 (Russian).
[89-2415]

USSR UDC 62-501.42:681.325.6

A METHOD OF ANALYZING THE STABILITY OF TRANSIENTS IN NETWORKS OF LOGIC ELEMENTS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 10, Oct 79 pp 165-172 manuscript received 14 Jan 79

DOYENIN, V. V. and SOLOV'YEV, V. P., Moscow

[Abstract] A digital grid processor for solving second-order partial differential equations by the method of finite differences is considered, this device constituting a typical branched network of logic elements such as inverters, 2-input conjunctors and 2-input disjunctors with small-scale or medium-scale circuit integration. With such elements mathematically described as combinations of linear and nonlinear components, delay time serving as the most characteristic parameter, a method of transients analysis is developed applicable to any asynchronous network as well. The method is based on simulation by ordinary nonlinear differential equations, basically for an ideal system and then taking into account oscillations, in a form suitable for solution with the aid of an analog or digital computer. Figures 3; references 5 (Russian).
[57-2415]

USSR UDC 621.376.54:62-504.42

STABILITY OF SYSTEMS WITH INTEGRAL PULSE-WIDTH MODULATIONS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 10, Oct 79 pp 51-57 manuscript received 13 Jul 78

ANTONOVA, N. A., Syktyvkar, and GELIG, A. KH., Leningrad

[Abstract] Under consideration is a closed system with a continuous linear component and one pulse element for integral pulse-width modulation. Sufficient conditions for asymptotic stability, on the whole, of equilibrium and periodic steady states under a constant external perturbation load are established from the characteristics of both and an integral equation describing the entire system. Two theorems to that effect are proved by the method of a priori integral estimates. For illustration, the results are applied to a pulse system with a fourth-order continuous linear component. References 4 (Russian).
[57-2415]

USSR UDC 621.382:861.3

A GENERAL DESCRIPTION OF THE AREA OF OPERATION OF ELECTRONIC CIRCUITS IN BOUNDARY TESTING PROBLEMS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 13-18
manuscript received 4 Apr 78; after revision 30 Jun 78

KRIVOSHEYKIN, A. V.

[Abstract] When boundary testing is performed, the problem arises of determining the standards for characteristics. The solution of the problem for one characteristic is known. Generally, when more than one characteristic must be used to accept or reject a device, the question of determining standards is still open. In this article, a random quantity of efficiency is introduced, providing a general description of the area of efficient operation, and allowing the problem to be solved using known statistical methods. A general description is thus produced of the area of efficient operation and a relationship established between the probability of proper operation and the limitations on multiple characteristics. This allows objective standards for characteristics to be determined with assigned tolerances for circuit elements with an economically suitable percentage of accepted products. References 12 (Russian).
[52-6508]

USSR UDC 681.325.65

SYNTHESIS OF THE FLAT TOPOLOGY OF CONNECTIONS WITH CONTACTS ON TWO CHAIN STRUCTURES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 87-89
manuscript received 13 Jul 78; after revisions 6 Feb 79

BAZILEVICH, R. P.

[Abstract] Tasks of synthesis of flat topology arise in the planning of integrated circuits and other devices. There are no regular methods for solution of the broad range of tracing of connections by formal synthesis. This article studies the development of methods allowing generation of all possible versions of topology models, as well as selection of optimal versions on the basis of predetermined criteria. The analysis is restricted to synthesis of models of topologies for one class of problems, to which many electronic and computer elements can be reduced. The method suggested allows easy synthesis of the topology of flat layouts for the class problems studied, plus direct selection of the optimal layouts by search for the longest path on graphs. Figures 3; references 4 (Russian).
[52-6508]

USSR UDC 389.14:621.317.32

STATUS AND PROSPECTS FOR METROLOGIC SUPPORT OF UNITY OF MEASUREMENTS OF ALTERNATING CURRENT AT FREQUENCIES OF UP TO 3 GHz

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 55-56
FEDOROV, A. M., KRESTOVSKIY, V. V. and SHCHEGLOV, V. A.

[Abstract] A study is made of problems of metrologic support of high-frequency means of voltage measurement in the 20 Hz-3 GHz frequency range. Unity of measurement of voltages in the USSR is based on the All-Union Standard GOST 8.075-73, which extends to measurement and reproduction equipment in the 20 Hz-3 GHz frequency range and establishes the procedure for transmission of the unit of measurement--the volt--from State Special Standards to actual measurement points. Various classes of volt-meters are briefly described. A plan has been developed for a new measurement system for testing measurement equipment to be used to measure AC voltages in the 20 Hz-3 GHz range, and extension of the existing standard to combine it with recommendation PC 5540-76 of the CEMA, considering the prospects for improvement of metrologic systems for voltage measurement. References 7 (Russian).
[55-6508]

USSR UDC 389.14:621.317.784.082.62

METROLOGIC SUPPORT OF NEW TYPES OF THERMOELECTRIC MICROWAVE WATTMETERS OF LOW AND MEDIUM POWER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 60-63

BIL'KO, M. I., TOMASHEVSKIY, A. K. and CHUYKO, V. G.

[Abstract] A study is made of some of the pecularities of determination of the primary error of microwave wattmeters in production and use. The conclusions of the article can be extended to dry calorimeters with measurement limits of not over 100 W. Tables 1; references 1 (Russian).
[55-6508]

USSR UDC 534.322.3.089.6.088

AN INSTALLATION FOR TESTING OF NOISE COEFFICIENT METERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 68-69

REZCHIKOV, A. A. and PUCHKOV, YE. V.

[Abstract] Combined testing of noise coefficient meters allows the error of the complete meter to be found, providing the best assurance of accuracy of noise measurements. An installation is developed for this purpose, allowing direct measurement of the error of the complete set and elimination of this error by introduction of the proper correction factor. The method of testing of the noise coefficient meter is based on comparison of the results of measurement of the noise coefficient of a receiver by the set being tested and by the standard installation. The installation is designed to provide an accuracy of 0.15 db. Figures 2; references 2 (Russian).
[55-6508]

USSR UDC 65.011.56:531.717.7:006.065

DEVELOPMENT OF THE PRODUCTION OF MODERN MEASUREMENT EQUIPMENT AT "KALIBR" PLANT

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 6-7

BUKHVALOV, YU. S.

[Abstract] Kalibr Instrument Plant in Moscow is one of the primary suppliers of measurement devices for linear and angular dimensions in machine building. During the 9th and 10th Five Year Plans, the plant began production of complex measurement instruments and automatic production lines based on electronic, optical and pneumatic devices. The plant is continuing also to produce traditional measurement devices based on mechanical operation (dial calipers, micrometers, angle measuring devices, levels, etc.). A general reconstruction of the enterprise is planned for the next Five Year Plan. The capacity of the plant is to be increased by a factor of 2.3 in comparison to the plan for 1980.
[55-6508]

USSR UDC 621.3.089.68:539.1.01

THE FIRST STATE STANDARD FOR UNITS OF POWER OF ABSORBED AND EQUIVALENT DOSES OF NEUTRON RADIATION

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 3-6

BREGADZE, YU. I., MARCHENKO, A. V., MASLYAYEV, P. F. and SIDORENKO, L. M.

[Abstract] In 1978, the State Standards Commission approved a system of devices for measurement of absorbed dose power and equivalent neutrons radiation doses, developed at the All-Union Scientific Research Institute of Physicotechnical and Radiotechnical Measurements (VNITFTFI). The new system of devices expands the range of neutron energies at the low end, increases the range of absorbed doses used in biology and medicine, decreases the systematic error, including cases when significant quantities of gamma radiation are also present, and improves calibration. Characteristics of the system of devices are presented. References 23: 22 Russian, 1 Western.
[55-6508]

USSR UDC 621.317.755:621.317.616

METHODS OF DETERMINATION AND MEASUREMENT OF AFC OF WIDEBAND OSCILLOGRAPHS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 56-58

BAYTURSUNOV, V. K., MANEVICH, V. Z. and FRUMKIN, V. D.

[Abstract] Assuming that the types of oscillographs considered are linear devices and considering that the input devices (stroboscopic converters and high speed traveling wave CRTs) are devices with distributed parameters, a general equation is presented for the AFC of these devices. The values of AFC determined by measurement, using variable frequency, constant voltage input signals are used to determine the output signal and restore the input signal in various types of measurements. Operations which must be performed to measure the values of AFC by the standard method suggested include: calibration of the indicator; placement of the probe at the required distance from the input of the oscillograph; maintenance of constant input voltage with variation of frequency. The method suggested was used to measure the AFC of the S7-12 oscillograph, and satisfactory results were achieved. Figures 2; references 1 (Russian).
[55-6508]

USSR UDC 621.317.784.082.62.08

MEASUREMENT OF THE COEFFICIENT OF EFFECTIVENESS OF A COAXIAL HEAT TRANSDUCER IN A MICROCALORIMETER FOR FREQUENCIES OF UP TO 18 GHz

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 63-65

KOLOTYGIN, S. A., KON'KOVA, L. T. and CHUYKO, V. G.

[Abstract] Thermoelectric microwave wattmeters with a coaxial input are becoming increasingly popular. However, there is no state standard for calibration of such wattmeters in the 10-18 GHz band. Measurements are performed of the effectiveness coefficient of a coaxial heat transducer on a calorimetric installation analogous to that used in the state standard for microwave power in waveguides, indicating the possibility and desirability of creation of a standard wattmeter with a coaxial input for use at frequencies of up to 18 GHz. Figures 3; references 6: 5 Russian, 1 Western.
[55-6508]

USSR UDC 621.317.784.088

MISMATCH ERROR IN TRANSMITTED POWER MICROWAVE WATTMETERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 65-66

PEREPELKIN, V. A.

[Abstract] Microwave wattmeters are divided into absorption and transmitted power types. Uses of the two types are outlined. Transmitted power wattmeters are connected into the line between a generator and a load. The indications of these wattmeters are related to the power transmitted to the load. This article presents equations allowing calculation of the coefficient of reflection at the output of such a wattmeter. If the coefficient of reflection at the input and output of the wattmeter and the coefficient of transmission are known, the necessary parameters can be calculated for determination of the mismatch error and the required correction factor to be applied to the results of measurement. The calculated data were confirmed by experimental measurements. Figures 1; references 3 (Russian).
[55-6508]

USSR UDC 621.371.39.089.68

RADIO ENGINEERING STANDARDS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 53-55

KIPARENKO, V. I., MEKHANNIKOV, A. I. and FRUMKIN, V. D.

[Abstract] A discussion is presented of the physical basis and the nature of radio engineering standard instruments. A number of characteristics of radio engineering standards are noted: broad range of frequencies of reproduceable physical quantities, up to 10^{15} Hz; variety of channels used (multiple wire, open, coaxial, wave guides, light guides); high requirements for unmeasured radio signal parameters; use of group standard testing to assure constancy of metrologic characteristics; and comparatively complex processing of the results of direct observations. Two main trends are seen in future development of standards: physical studies of the application of new physical effects, and the use of engineering achievements to create new standards based on existing physical principles.
[55-6508]

USSR UDC 681.3.087.92

ACCURACY OF SCALE-TO-TIME CONVERSION USING MEMORY CRT

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 13-16

RABINOVICH, S. G. and FILINOV, V. N.

[Abstract] Scale-to-time conversion (MVP) with a memory CRT is at present the most effective method of measurement of the parameters of one-time nano-second processes, allowing automation of measurement processes in combination with computers. The operation of these devices is described, and methods for increasing accuracy are discussed briefly. The energy spectrum of the signal at the output of the CRT consists of both continuous and discrete parts. The intensity of the continuous part increases with increasing dispersion of the process being studied, while the intensity of the discrete part decreases. The error of conversion depends essentially on the dispersion of the process being studied and its derivative. Equations derived in this article allow estimation of the values of the components of conversion error. Figures 2; references 4 (Russian).
[55-6508]

USSR

NEW MEASUREMENT DEVICES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 75-76

UNSIGNED

[Abstract] Several new measurement devices are listed and characteristics described, including: the VLS-1g special laboratory balance, designed for precise determination of the mass of substances under laboratory conditions; the G6-31 programmable special shape signal generator operating in the 0.001 Hz-990 KHz band; the IS-PCH intermediate frequency attenuation meter; the F246 digital frequency meter for high precision measurement of frequencies in the 45-55 Hz band, resolution 0.005 Hz; the TS4354 multimeter for measurement of DC voltage and ampherage, AC voltage and ampherage, DC resistance and AC transmittance; the FC frequency photometer for measurement of the energy or maximum power of a single pulse; and the FN nanosecond photometer.
[55-6508]

USSR

CREATION OF MOBILE TESTING LABORATORIES AT "INTERETALONPRIBOR" SCIENTIFIC-PRODUCTION ORGANIZATION

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 p 77

NIKIFOROVA, Z. S. and YUMATOV, V. N.

[Abstract] "Interetalonpribor" is currently working on the creation of mobile testing laboratories for the testing of motor vehicle scales, measurement of quantities and flow rates of liquids and gases, and measurement of ionizing radiation to check radiometric and dosimetric instruments. Technical requirements for mobile laboratories for these measurements have been coordinated with other CEMA member nations.
References 5 (Russian).
[55-6508]

USSR UDC [621.315.612.6-42:678.5].019.34.001.5

HEAT RESISTANCE OF FABRICATED ELECTRICAL-GRADE GLASS PLASTIC

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 79 pp 33-34

DULITSKAYA, G. M., engineer, KONOVALOV, V. V., candidate in chemical sciences, ZININ, YE. F., candidate in technical sciences, SHARAKINA, L. A., engineer, MALYAVKINA, V. M., engineer, SHCHERBACHENKO, A. A., engineer and YELINEK, V. I., candidate in chemical sciences

[Abstract] A new glass plastic with an epoxy-polyetheroimide binder has been developed for insulation of electrical machines. It features a low curing temperature (100-120°C), a low viscosity and a long shelf life. Extrusion of insulation tape from this SPP-VID material by the continuous process is possible at rates of 1.0-1.5 m/min, i.e., 5-10 times faster than from the existing industrial glass-epoxy grades (SPP-E). Fabrication of insulation wedges from this material is possible with not more than 2 percent waste. Samples have been tested for mechanical strength in tension (1128/883 MPa) and in impact (34 MPa·cm), for heat resistance according to Martens (deflection temperature 285°C), for electrical resistivity (10^{13} Ω·cm), breakdown voltage (27 kV along the fibers), and found to be either equal or superior to samples of SPP-E and "Vakosit" (made in West Germany). The results of aging tests indicate, furthermore, the suitability of this material as class H insulation. Figures 2; tables 2.
[95-2415]

USSR UDC [621.315.616.97:621.59].001.4

PROPERTIES OF EPOXY COMPOUNDS AT CRYOGENIC TEMPERATURES

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 79 pp 34-36 manuscript received 20 Nov 78

GOLUBKOV, G. YE., candidate in technical sciences, SAVEL'YEVA, L. N., engineer, PINTAL', YU. S., candidate in technical sciences, and MINEIN, V. F., candidate in technical sciences

[Abstract] The use of electrical insulation at cryogenic temperatures requires that it have a high resistance to thermal shock, typically a temperature drop from 300 to 4.2 K. At such temperatures epoxies are in a vitreous state and have properties somewhat similar to those of glass and inorganic enamels. Here a study was made to the thermal shock resistance of epoxy compounds with various additives. Boron nitride, with a relatively high thermal conductivity, has been found to contribute most

to the thermal shock resistance of a compound. Also measured were the electrical strength, shrinkage, dielectric permittivity and loss tangent at 10 and 77 K as well as at 290 K, for reference, so that the trend of the temperature dependence of these properties in the cryogenic range could be established. An analysis of the data and results indicates, furthermore, the effect of technological factors such as vacuum and pressure, surface finish and adhesion to metal surfaces on these properties of epoxy compounds. Thus, for instance, preliminary vacuumization already prevents porosity and partial discharges in weak electric fields. Figures 3; tables 2; references 2 (Russian).
[95-2415]

USSR UDC 621.317:335.3

USE OF HIGHER TYPES OF OSCILLATIONS FOR MEASUREMENT OF TAN δ OF CIRCULAR RODS AT MICROWAVE

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 71-72

POYARKOVA, V. YE. and ZAL'TSMAN, YE. B.

[Abstract] An earlier work described a method for measurement of the dielectric permeability of dielectrics in the form of circular rods. The present article extends this method to measurement of the dielectric loss angle tan δ so that both quantities can be determined simultaneously. The effect of the diameter of the rod and, specifically, its relationship to the critical diameter, are analyzed. The results presented indicate good agreement of the values of ε and tan δ measured with various types of oscillation. Figures 1; tables 1; references 3 (Russian).
[55-6508]

USSR UDC 621.373.51

SYNCHRONIZATION OF A SOLID STATE NONISOCHRONIC MICROWAVE OSCILLATOR WITH ARTIFICIAL DELAYING FEEDBACK

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 33-37
manuscript received 27 Mar 78

ROZDOBUD'KO, V. V. and GOLOVKIN, A. S.

[Abstract] Results are presented from analysis of the synchronization of a nonisochronic microwave oscillator, the artificial delay time of which does not exceed a few periods of oscillation. The oscillator analyzed consists of an adder, a directed branching circuit, a circulator, the actual oscillator and a phase invertor. The synchronization signal is fed to the autooscillator through the adder and circulator, the feedback signal is applied through the directed branching circuit, phase invertor, adder and circulator. The introduction of the artificial feedback is shown to be an effective and simple method of expansion of the band of synchronization. The feedback loop can be used to control the basic characteristics of the oscillator. Figures 3; references 6 (Russian).
[52-6508]

USSR UDC 621.373.93

THEORY OF SYMMETRIC AUTOPARAMETRIC THIRD-ORDER SUBHARMONIC OSCILLATORS

Tashkent IZVESTIYA AKADEMII NAUK UZBEKSKOY SSR: SERIYA TEKHNICHESKIKH NAUK in Russian No 5, 1979 pp 46-68 manuscript received 30 Jan 79

ISMAILOV, Z. I., Tashkent Polytechnic Institute imeni Abu Raykhan Beruni

[Abstract] It has been demonstrated experimentally that odd subharmonics can be generated in an autoparametric oscillator built on symmetric differential and bridge circuits with either active or reactive nonlinear elements, even though in symmetric circuits the synchronizing sine and cosine components become zero. Here the possibility of sustaining the third subharmonic in a regenerative oscillator is demonstrated analytically, such an oscillator consisting of two stages without intercoupling connected in parallel across the sources of pump and bias voltage. The possibility of stable subharmonic generation is based on the statistics of phase combinations and maximum likelihood of boosting rather than cancelling of signals. Figures 2; references 1 (Russian).
[65-2415]

USSR UDC 621.373.5

EXPERIMENTAL STUDY OF A MULTIDIODE OSCILLATOR BASED ON AVALANCHE-TRANSIT DIODES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 74-77 manuscript received 28 Mar 79

SHIRYAYEV, A. V. and MERZLOV, V. S.

[Abstract] Parallel connection of several active devices into a common resonator cavity is, with proper stabilization, a generally effective way to build high-power 1-12 GHz oscillators or regenerative amplifiers. Here such an oscillator with six 3A707 avalanche-transit diodes in a cylindrical resonator cavity is considered, such a design featuring an exceptionally high degree of compactness. An experimental study of this oscillator was made, for the purpose of empirically maximizing its output power. The output power of any one diode has been found to depend largely on the distance from that diode to the mid-height point of the cavity, the optimum distance being close to three quarters of the wavelength in free space, and not to be very sensitive to variations in the impedance of the

quarter-wavelength matching transformer. The output power of the oscillator has also been found to increase proportionally with the number of diodes in operation. Failure of one diode reduces the output power by not more than 40 percent in the case of a 6-diode oscillator and by increasingly less with a larger number of diodes. Figures 2; references 6: 2 Russian, 4 Western.
[89-2415]

USSR UDC 621.373.5.018.782.3

EXPERIMENTAL STUDY OF FREQUENCY STABILIZATION IN GUNN-EFFECT OSCILLATORS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 93-98
manuscript received 3 Jan 78; after revision 7 Aug 78

ANTONOV, S. V., GOMOZOV, V. I. and LOSHAKOV, V. A.

[Abstract] An experimental study was made to verify the theoretically calculated transient characteristics of Gunn-effect oscillators, taking into account the initial conditions of excitation as well as the magnitude of the regeneration factor. The special test apparatus built for this purpose included an oscillograph, a microwattmeter, a vacuum-tube voltmeter, an electronic-counter frequency meter, a spectrum analyzer, a modulator, a synchronizer and a power supply. The tested oscillator included a resonator cavity with a waveguide structure and operated in the centimeter wave band. The frequency stabilization time, being very short, had to be measured indirectly by the spectral method. The regeneration factor gR_e (g denoting the differential diode conductance and R_e denoting the equivalent resistance of the loaded tank circuit) was determined at an operating point within the stable range near the center of the descending segment of the current-voltage curve. The tank circuit parameters were determined indirectly from impedance measurements and the varactor circuit parameters were measured by the series-resonance method. A complete error analysis indicates that theoretical calculations have been quite accurate, within 10-15 percent with $gR_e = 2$ but within 10-40 percent with $gR_e > 2$ or $gR_e < 2$. The results indicate, furthermore, that a Gunn-effect oscillator is controllable during fast frequency modulation. Figures 3; references 5 (Russian).
[89-2415]

USSR UDC 621.311.1.001

OPTIMIZING THE DELIVERY OF ACTIVE POWER TO A POWER GRID SYSTEM TO COVER ITS LOAD CURVE IN THE CASE OF LARGE POWER DEFICITS

Tashkent IZVESTIYA AKADEMII NAUK UZBEKSKOY SST: SERIYA TEKHNICHESKIKH NAUK in Russian No 5, 1979 pp 42-45 manuscript received 25 May 79

SHAKIROV, Z. and SYTDYKOV, R. A., Tashkent Polytechnic Institute imeni Abu Raykhan Beruni

[Abstract] Since universal deficit characteristics of electric power grid systems are not yet available in terms of losses as a function of the energy consumption level and time in each node, these losses are assumed to be distributed proportionally to the load levels. For optimizing the power regulation countermeasures in the case of power deficit, an algorithm of programmed countermeasures is shown here which takes into account encumbering constraints on power flow reversal in the transmission lines. This algorithm essentially adheres to the proportionally principle, minimizing deviations from it, according to which the nodal elements of the payoff matrix of regulation vectors are evaluated. This evaluation, by the iteration method, observes the regulation thresholds at each node and the power reversal ceilings in all other transmission lines. Four or five iterations usually yield the optimum of admissable solutions. The algorithm, applicable to radial as well as ring grids, has been written in FORTRAN. References 2 (Russian).
[65-2415]

USSR UDC 621.316.35(088.8)

A NEW COLLECTING BAR STRUCTURE FOR A 35-kV OPEN DISTRIBUTION DEVICE

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 8, Aug 79 pp 16-17

SAPOZHNIKOV, YE. M., DZHARZHANOV, A. K., GROYSER, F. G. and TROFIMOV, A. S., engineers

[Abstract] A new structure is described for the collecting bars of a 35-kV open distribution device (KSSh-35). The proposed structure is a support to which standoff rod insulators are attached with rigid current-carrying loops. The three phases are vertically arranged one above the other. The bars are tapped to the equipment by flexible conductors 5-6 percent longer than the distance between the tap point and the equipment

terminal. Four three-phase taps can be accommodated on a single structure. The support is a reinforced concrete pedestal. The KSSh-35 is simple to manufacture and reliable in use. Replacement of an insulator or an entire phase presents no difficulties. Installation of these facilities for collecting bars in substations will save money, labor and material. Figures 2; references 2 (Russian).
[14-6610]

USSR

NEW NORMS FOR TECHNOLOGICAL PLANNING OF SUBSTATIONS WITH HIGH VOLTAGE OF 35-750 kV

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 8, Aug 79 pp 75-76

MURASHKO, N. V. and KHEYFITS, M. E., engineers

[Abstract] These new standards were approved in 1978. The basic changes apply to further standardizatior of design formulations, reduction of cost and labor input in construction and millwright work, and improvement in the quality of this work based on using industrial structural components. In addition, provisions are made for improving the conditions of operation of substations, and working reliability. Recommendations are made on selecting building sites for substations on ground that is not in agricultural use or suitable for tillage, and other requirements are specified to reduce costs and labor inputs in construction. The proposed norms contain sections dealing with simplification of access roads and parking facilities, and also with reducing the area occupied by the substation and reduction of material and equipment inputs. Changes have also been made in safety regulations and accident prevention measures and in specifications for service and repair jobs.
[14-6610]

USSR UDC 621.311.019.3:658.011.56

A METHOD OF SIMULTANEOUSLY EVALUATING THE SERVICE CONTINUITY INDICATORS OF ELECTRICAL EQUIPMENT OF ALL USERS IN A COMPLEXLY CLOSED NETWORK OF A LARGE ELECTRICAL SYSTEM

Minsk IZV. VUZ: ENERGETIKA in Russian No 7, Jul 79 pp 15-20 manuscript received 5 Sep 78

GURSKIY, S. K., candidate in technical sciences and lecturer, "Order of Red Labor's Banner" Belorussian Polytechnic Institute and ALEKSANDORV, O. I., candidate in technical sciences and lecturer, Belorussian branch, Institute of Power Engineering imeni G. M. Krzhizhanovskiy

[Abstract] A new method of evaluating the service continuity of users electrical equipment is proposed which can be very effective in the case of large systems with many users. It yields the service continuity indicators, namely the probability of utilizable state, for all users as well as the integral one for the entire system. It involves an algorithm of sequential quasi-equivalentization without unwieldy restructurizations of the utilizability graph. The logic of this procedure is based on five almost self-evident theorems regarding graph transformations. Accordingly, a graph is thus transformed to a multiray star or, if it is a complex one, first broken up into subgraphs. Random errors can be eliminated by randomization and averaging over all realizations of the vector of service continuity indicators in a random set of equivalentizable graphs. Systematic errors can be eliminated by alternate application of the conditions of invariance pertaining to the probabilities of utilizable and nonutilizable states respectively. Figures 3; references 1 (Russian). [66-2415]

USSR UDC 621.315.2.015

OVERVOLTAGES ON THE GENERATOR SIDE DURING PASSAGE OF LIGHTNING WAVES THROUGH TRANSFORMER COUPLINGS

Minsk IZV. VUZ: ENERGETIKA in Russian No 7, Jul 79 pp 20-24 manuscript received 21 Nov 78

KADOMSKAYA, K. P., doctor in technical sciences, Professor; TIKHONOV, A. A., candidate in technical sciences; IVANOV, A. V., student and LISKEVICH, O. V., student, Novosibirsk Institute of Electrical Engineering

[Abstract] In order to select the proper lightning protection in large electric power networks, it is necessary to know the overvoltages on the generator side during passage of lightning waves through transformer

couplings. For this purpose the transient processes in a transformer are described here by a system of differential equations and analyzed by simulation of the circuit and of the voltage oscillograms, according to a special program on the BESM-6 digital computer. The results reveal that the first overvoltage peak is determined by the electrostatic coupling between both transformer windings; it is dangerously high but can be eliminated by means of an appropriate capacitor on the low-voltage side. The second and all subsequent overvoltage peaks on the low-voltage side are determined by the electromagnetic coupling between both transformer windings, they are dangerously high without a protective limiter on the high-voltage side and even then when the generator is disconnected. Figures 3; tables 1; references 3: 2 Russian, 1 Western.
[66-2415]

USSR UDC 621.681.3

A NEW METHOD OF SAFETY TRAINING THE OPERATORS OF UNITIZED FOSSIL-FUEL ELECTRIC POWER PLANTS

Moscow ENERGETIK in Russian No 5, May 79 pp 11-12

LYASHENKO, L. I., engineer and KLUSHIN, YU. A., candidate in technical sciences

[Abstract] The article outlines a new safety training technique used to instruct operators at the Mosenergo TETs-23 Heat and Electric Power Plant equipped with T-250/300-240 district heating turbines. A chart is kept for each trainee, with a record of times required for determining the cause of a change in a major parameter, making a decision, and correcting the problem. The total time is then compared with the time available to an operator in the actual emergency situation. If the trainee fails to complete the assignment within the required them, the test is repeated with a lapse of several days. Implementation of this program showed that 36 percent of the tested operators were unable to solve the problem within the set time interval in the case of a reduction in live steam temperature, and 49 percent of the operators failed on tests for a reduction of the vacuum in the turbine condenser. A worker is given the responsibility of independent operator only after successfully completing two training assignments. Figures 2.
[44-6610]

USSR UDC 550.834

SELECTION OF THE FORM OF THE CONTROL SIGNAL IN VIBRATION SEISMIC PROSPECTING

Kiev AVTOMATIKA in Russian No 3, May/Jun 79 pp 24-29 manuscript received 8 Jul 77

RADCHENKO, I. F., Institute of Cybernetic, Ukrainian Academy of Sciences

[Abstract] In seismology, increasing use is being made of low-power sources generating broadband signals, instead of explosives. Vibrators are particularly widely used. The energy radiated by a vibrator over a long period of time is accumulated in the form of a seismic recording, then correlation analysis is used to collect the energy over a short interval of time, creating the effect of a powerful explosive pulse. The method of vibration seismic prospecting is promising only if the energy imparted to the geological medium by the vibrator over the finite time of excitation is no less than the energy of a pulsed source. This article presents the characteristics of pseudorandom signals, M-sequences which are noise-like signals, sequences of pulses rectangular in shape varying between two voltage levels. This type of signal can be easily formed in a shift register with feedback, and is quite suitable for vibration seismic prospecting. Figures 1; references 10: 5 Russian, 5 Western.
[26-6508]

USSR UDC 621.396.67.08

LENGTH OF A PULSE USED TO ESTIMATE THE WIDTH OF THE INITIAL PORTION OF A SPECTRUM

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 79 pp 58-60

PEREVERZEV, L. A.

[Abstract] Pulses with known absolute spectral density are used to test selective receiving and amplifying devices. These pulses are usually generated using the "initial" low frequency section of the spectrum. This article shows how to estimate the length of a short pulse or the duration of a steep pulse edge in determining the width of the initial portion of the spectrum. The measure of length is the radius of inertia. The length of the pulse should be measured at the 10 percent level. An equation for use in this case is presented. Figures 2; references 2: 1 Russian, 1 Western.
[55-6508]

USSR UDC 621.378.3:621.317.36

AN INTERFEROMETER WITH A MOVING MIRROR FOR MEASUREMENT OF THE PARAMETERS OF OPTICAL RADIATION WITH ANGULAR MODULATION

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 90-92
manuscript received 9 Feb 78; after revision 14 Feb 79

LEN'KOV, S. I., POPOV, L. N.

[Abstract] A study is made of an optical discriminator based on a dual-beam interferometer. The mirror must be mobile in order to change the path difference of the rays in the interferometer. When the input receives unmodulated light radiation and the mirror scans, the intensity of radiation at the output of the interferometer is modulated at the scanning frequency. An experiment is used to determine the variation of the ratio of depths of modulation with voltage across the modulator. Figures 2; references 3: 2 Russian, 1 Western.
[52-6508]

USSR UDC 621.378.33+535.89

TRANSIENT PROCESSES UPON SWITCHING OF A LASER LOGIC ELEMENT

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 42-47
manuscript received 20 Jun 78; after revision 18 Dec 78

VOLOSHCHENKO, YU. I., DERYUGIN, L. N., KURDYUMOV, O. A., SOTIN, V. YE., FROLKIN, V. T. and CHEREMICKIN, I. V.

[Abstract] The process of switching of a laser logic element was modeled using the balance equations of the laser in the two-level approximation, plus an equation relating the density of photons propagating along the X axis and averaged over the length of the laser logic element to the density of photons of the damping signal at the input. The calculation performed showed that the intensity of lasing upon switching of the pumping source is represented by a sequence of attenuating pulses if the intensity of pumping is slightly higher than the threshold value. The oscillating nature of lasing in a laser logic element is, however, no obstacle for performance of its functions. Switching times on the order of 0.1-0.2 ns can be achieved with proper selection of parameters. Figures 6; references 5 (Russian).
[52-6508]

USSR UDC 621.373.826

USE OF MICROWAVE GAS DISCHARGE IN LASERS (SURVEY)

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 55-68
manuscript received 19 Mar 79

MULLER, YA. N.

[Abstract] Transverse high-frequency of microwave discharge in helium-neon lasers has eliminated most drawbacks of d.c. discharge, inasmuch as it provides for higher and more uniformly spread amplification with less pumping power, removes saturation and thus increases the peak emission power, allows for a higher optimum gas pressure as well as for operation at very low gas pressures so that parasitic oscillations will be avoided, makes possible internal amplitude modulation, and is not encumbered by undesirable gas density redistribution which occurs in a constant electric field. Here the design characteristics of such lasers are reviewed, also those of other high-frequency and microwave gas lasers such as the molecular CO_2 laser performing best with combined high-frequency (or microwave) and d.c. discharge and the $He-Cd^+$ ion laser. Figures 7; references 69: 37 Russian, 32 Western.
[89-2415]

USSR UDC 621.373.122

DOPPLER AUTODYNES BASED ON SEMICONDUCTOR DEVICES (SURVEY)

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 44-54
manuscript received 26 Mar 79

KHOTUNTSEV, YU. L.

[Abstract] Doppler autodynes for radar applications are now built with nonlinear semiconductor elements which facilitate mode generation and conversion in a small-size package. Here the autodyne processes and performance are analyzed, theoretically, starting from the fundamental differential equation which describes the appearance of a reflected signal at the input stage. There follows a comparative survey of the basic performance parameters of autodynes built with negative-resistance (tunnel, Gunn effect) diodes, avalanche-transit (IMPATT) diodes and injection-transit barrier (BARITT) diodes, all featuring a power conversion factor larger than unity. An important consideration their transmission and fluctuation characteristics, also their behavior and performance in the case of large reflected signals. Figures 3; references 27: 10 Russian, 17 Western.
[89-2415]

USSR UDC 548.0:537.001.1

DEVELOPMENT OF METHODS AND EQUIPMENT FOR PRODUCING LARGE CRYSTALS

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 79 pp 4-7 manuscript received 13 Mar 79

BODYACHEVSKIY, S. V., candidate in technical sciences, AVVAKUMOVA, L. A., engineer, and KHAZANOV, E. YE., candidate in technical sciences

[Abstract] There is a demand for large flawless crystals of leucosapphire and various halogenides for new highly sensitive devices. This calls for special methods of crystal growing, with careful attention to the boundary conditions during the crystallization process and to the control of heat transfer rates and temperature fields in the "crystal-melt" system. Most promising are the Stockbarger method and the Stober method, also a variant of the Kiropulos method and the method of a shifting isotherm. The gist of the Stockbarger method is a slow vertical movement (1-5 mm/h) of the crucible relative to a gradiental temperature field ($>10°C/cm$), establishment of an isothermal field within the crystallized bulk and subsequent annealing of the crystal at a programmatically varied temperature. In the Stober method this movement of the crucible has been eliminated and crystallization occurs, instead, due to programmed temperature changes and oriented heat transfer. An essential factor in crystal growing is maintaining a flat or slightly convex crystallization front. The authors have developed special equipment ISEV-8.8/15G for growing crystals by these methods: CaF_2 and BaF_2 100 mm high and 600 mm in diameter according to Stockbarger, leucosapphire 125 mm high and 225 mm in diameter according to Stober, LiF 100 mm high and 350 mm in diameter by the method of a shifting isotherm. Crystals of diameters up to 600 mm and heights smaller than the diameter should be producible by appropriate modifications of the equipment and control of the process parameters. Figures 4.
[95-2415]

USSR UDC 621.315.592

ACOUSTICAL BODY AND SURFACE NOISES UPON AMPLIFICATION OF SURFACE WAVES

FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 7, 1979 pp 1269-1272
manuscript received 11 May 78

TIMAN, B. L., KOMAR', V. K., ADOL'F, YE. M.

[Abstract] Studies are presented of the variation in intensity of acoustical noise with wavelength of the light which illuminates a photosemiconductor and the drift voltage. The study of surface acoustical noise is made more complex by the fact that body noise, longitudinal, quasi-transverse and true shear noise, is amplified along with the surface noise. The experiments were performed on cadmium sulphide single crystals with three types of surface orientation. The variation in the intensity of acoustical noise as a function of wavelength of light was complex, with maxima observed on the curves. As the length of the wavelength of the light increased, the role of surface defects in the amplification of relay waves decreased. The amplification of acoustical noise with supersonic drift of charge carriers varies in nature depending on the orientation of the crystal and the magnitude of the drift field on its surface, and the relative contribution of surface and body acoustical noise to the acoustical noise on the surface depends on the wavelength of the light with which the photosemiconductor is illuminated. Figures 4; references 3: 1 Russian, 2 Western.
[288-6508]

USSR UDC 621.315.592

CHARACTERISTICS OF A TRANSISTOR UNDER CONDITIONS OF UNIFORM PRESSURE ON PART OF THE EMITTER SURFACE

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 13 No 8, Aug 79 pp 1533-1639 manuscript received 1 Jun 78; in final editing 6 Mar 79

RISTIĆ, S. D. and CVEKIĆ, V., Niš University, Jugoslavia

[Abstract] The authors study the current transfer ratio, input/output characteristics and breakdown voltage of planar transistors in the common-emitter circuit arrangement when mechanical stress is applied to part of the emitter surface. The needle used for pressure application was made of sapphire with a spherical tip. The tip was flattened so that the contact area was $14.92 \cdot 10^{-6}$ cm (a circle with diameter of 42.5 μm). Force

was applied to this needle normal to the surface of the emitter, producing uniform mechanical stress on the surface. It was found that application of uniform pressure to part of the emitter surface up to the elastic limit increases the current transfer ratio by more than an order of magnitude. Under the same conditions, the base and collector currents increase symbatically with the saturation voltage, while the collector-emitter breakdown voltage decreases. All theoretical results are experimentally confirmed. The authors thank T. Toshicheva for interest in the work. Figures 8; references 7 (Western).
[43-6610]

USSR UDC 621.315.592

PARTICULARS OF CHARACTERISTICS OF THE MEMORY EFFECT IN THE As-Te-METAL SYSTEM

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 13 No 8, Aug 79 pp 1665-1667 manuscript received 26 Feb 79

KOLOMIYETS, B. T., ZVEREV, A. V., KALMYKOVA, N. P., LEBEDEV, E. A., TAKSAMI, I. A. and SHPUNT, V. KH., Physicotechnical Institute imeni A. I. Ioffe, Academy of Sciences USSR, Leningrad

[Abstract] Application of a voltage pulse with amplitude of 10-20 V to a vitreous chalcogenide semiconductor film about 1 μm thick switches the film from a high-resistance to a low-resistance state. The current-voltage curve has a long section of negative resistance. In all known cases, a recording time of $\sim 10^{-2}$ s at a current of several mA has been required to produce the low-resistance state with memory. Resetting to the normal high-resistance state occurs with passage of a current pulse of 10^{-2} -10^{-1} A with duration of 10^{-6} s. In studying the electrical properties of chalcogenide materials, the authors have observed a memory effect that is distinguished by total absence or weakly pronounced negative resistance with the transition from the high-resistance to the low-resistance state requiring a pulse energy several orders of magnitude lower than for conventional films. This new memory effect was discovered in alloys of the As-Te-metal system on planar specimens with nickel electrodes having a gap of about 10 μm. It was found that switching could be achieved with a pulse on only ~2 V at a duration of 10^{-5} -10^{-4} s with current of no more than 10^{-3} A. The high-resistance is restored by a current pulse of $\sim 10^{-3}$ A with duration of $\sim 10^{-7}$ s. The authors thank G. V. Fridlider for assistance with the work, and M. Ye. Boyko for doing the x-ray analysis. Figures 2; references 5: 2 Russian, 1 Hungarian, 2 Western.
[43-6610]

USSR UDC 621.315.592

ON THE FEASIBILITY OF SETTING UP A UNIFORM ELECTRIC FIELD IN A SPECIMEN LOCATED IN A TRANSVERSE MAGNETIC FIELD, AND THE NULL METHOD OF DETERMINING CHARGE CARRIER MOBILITIES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 13 No 8, Aug 79 pp 1667-1669 manuscript received 27 Feb 79

DOBROVOL'SKIY, V. N. and KROLOVETS, A. N., Kiev State University imeni T. G. Shevchenko

[Abstract] In research on the influence that a transverse magnetic field has on the passage of current through semiconductors, including Hall measurements, the specimens are usually rectangular in shape, as shown in the diagram of Fig. 1. In such a specimen, the electric field close to contacts K_1 and K_2 is always inhomogeneous. The field intensity at the corner points (B and D in the case of n-type conductivity) may be many times the field strength in the middle of the specimen, and according to theory should become infinite. In this paper it is shown that the electric field is homogeneous throughout the volume of specimens with the shape shown in Fig. 2, where the planes of contacts K_1 and K_2 make an angle $\pi/2 - \alpha$ with the surfaces that are free of contacts, where α is the non-zero positive Hall angle, $\tan\alpha = \mu B$, μ is the Hall mobility, B is the magnetic field induction. Measurements are made in the experimental setup shown in Fig. 3 with one of the contact split in two and connected as shown to two identical resistors R and a galvanometer . This implements the Hall current null method, but without restrictions on the galvanometer resistance, so that the technique can be used to determine the Hall mobility of low-resistance materials. Figures 3, references 5: 2 Russian, 3 Western.
[43-6610]

Fig. 1

Fig. 2

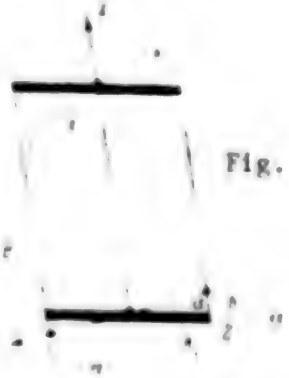
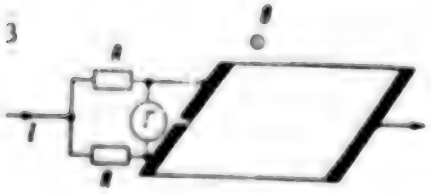


Fig. 3



USSR UDC ДЭ-2513/78

THE MAGNETORESISTIVE EFFECT ON MICROWAVE FREQUENCIES IN n-InSb DISKS WITH VARIOUS ELECTRODE CONFIGURATIONS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 13 No 8, Aug 79 pp 1674-1675 manuscript received 3 Apr 78

KOMOV, A. N., KUDRYAKOV, YU. P. and MOISEYENKO, A. K., Kuybyshev State University

[Annotation of an article deposited in "Elektronika" Institute]

[Abstract] The magnetoresistive effect is studied in n-type indium antimonide semiconductor disks 4 mm in diameter on microwave frequencies. An analysis is made of the influence that electrode arrangement has on the measured magnetoresistance. Relations are given for the relative change in resistance of sensors in a waveguide channel as dependent on power level and constant magnetic field. The results are compared for measurements in microwave and DC magnetic fields. It is shown that the magnetoresistive effect is considerably dependent on electrode placement, and that there is practically no change in the resistance on microwave frequencies in sensors with a closed external electrode.
[43-6610]

USSR UDC 621.372.837.4:621.373.51

MICROWAVE EQUIPMENT WITH POWER COMBINING OF SEMICONDUCTOR DEVICES (SURVEY)

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 17-29 manuscript received 3 Apr 79

ALYBIN, V. G. and LEBEDEV, I. V.

[Abstract] Electrodynamic mechanisms are reviewed which make feasible combining the power of semiconductor devices in microwave equipment such as regulators, oscillators and amplifiers. Seven requirements which such a system must meet are taken into consideration: possibility of extensive staging with a large number of devices, absence of parasitic oscillations, uniform load distribution, compatibility with d.c. supply components, adequate heat dissipation throughout, packagability without exceeding size limitations, and high reliability. Most effective are parallel and bridge connections, coaxial-waveguide structures, special resonator cavity configurations, and insertion of absorbers for suppression of parasitic modes. Figures 11; references 60: 17 Russian, 43 Western.
[89-2415]

USSR UDC 621.373.5:621.382.2

LIMITING PARAMETERS OF SEMICONDUCTOR MICROWAVE DEVICES AND THEIR RELATION TO THE CHARACTERISTICS OF SEMICONDUCTOR MATERIALS (SURVEY)

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 5-16
manuscript received 13 Mar 79

TAGER, A. S.

[Abstract] The power input to semiconductor devices is generally limited by electrical and thermal factors such as breakdown and overheating, which in turn depend largely on the dimensions of the active zone and the properties of the semiconductor material. Here the relations are reviewed which determine the power characteristics (power output, efficiency) and the frequency characteristics (operating range) of semiconductor microwave devices. The survey covers bipolar and field-effect transistors as well as avalanche-transit, variable-capacitance, and switching diodes. In conclusion, wide-gap materials (Si, GaAs, αSiC) and structures suitable for microwave power devices are considered. Tables 3: references 14: 10 Russian, 4 Western.
[89-2415]

USSR UDC 621.375.121

SOLID-STATE MILLIMETER-WAVE REFLECTION AMPLIFIERS (SURVEY)

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 30-43
manuscript received 17 Apr 79

KOTSERZHINSKIY, B. A., PARFENOV, A. A. and TARANENKO, V. P.

[Abstract] Further development of and more applications for millimeter-wave amplifiers based on avalanche-transit and Gunn-effect diodes are predicted in the 1980s. Here coaxial-waveguide constructions for reflection-amplifiers are considered, their parametric synthesis and small-signal as well as large-signal performance characteristics. A design procedure is outlined which, using graphoanalytical methods, includes a review of performance requirements, basic calculations and experiments, optimization and final refinements. According to the present state of the art, 30 GHz (10 W) to 90 GHz (0.3 W) multistage amplifiers with power compounding are already feasible and, moreover, the noise factor can be reduced to 8 dB by use of InP as the semiconductor material. Figures 8; tables 4; references 54: 7 Russian, 47 Western.
[89-2415]

USSR UDC 621.375.121

ANALYSIS AND COMPUTER-AIDED OPTIMIZATION OF WIDEBAND REFLECTION AVALANCHE-TRANSIT DIODE AMPLIFIERS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 69-73
manuscript received 22 Mar 79

BALYKO, A. K.

[Abstract] Reflection avalanche-transit diode amplifiers and the feasibility of extending their bandwidth are considered. On the basis of an analysis of the effect which the crystal mounting has on the diode impedance and on the amplifier amplitude-frequency characteristic, the design is optimized for a maximum attainable 25-30 percent relative bandwidth with a gain of 8-4 dB. This is achieved by means of a matching circuit with which the inductance can be maintained within the L_m 0.5-0.8 nH range and the capacitance can be maintained within the 0.2-0.4 pF range. Calculations were made with the aid of a computer. Figures 3; references 8: 5 Russian, 3 Russian.
[89-2415]

USSR UDC 621.382.2

A SUPERREGENERATIVE MICROWAVE AMPLIFIER BASED ON A GUNN-EFFECT DIODE WITH SELF-SUPEROSCILLATION

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 78-83
manuscript received 30 May 78

MALYSHEV, V. A. and ROZDOBUD'KO, V. V.

[Abstract] A superregenerative microwave amplifier based on a Gunn-effect diode is considered where such a diode, owing to its negative low-frequency conductance, becomes the source of superoscillations. The theoretical analysis, based on the equivalent circuit of such an amplifier operating in the reflection mode, covers only the two extreme cases: first low bias voltages near the threshold and almost rectangular superoscillation voltage pulses, then high bias voltages and a sinusoidal superoscillation voltage. The complete performance characteristics have been determined experimentally. These include the dependence of both gain and bandwidth on the input power at a moderate constant bias voltage (6 V), their dependence on the bias voltage at a constant input power (10^{-5} mW), amplitude-frequency characteristics and noise factor measurements. The results reveal a linear operating range at low power levels and a logarithmic operating range at higher power levels, a gain higher than 60 dB with a noise factor of 40 dB being attainable at frequencies above 300 MHz. Figures 5; references: 8 Russian.
[89-2415]

USSR UDC 621.382.029

RAISING THE UPPER CUTOFF FREQUENCY OF EMISSION IN GUNN-EFFECT DIODES WITH INHOMOGENEITIES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 89-92
manuscript received 16 Jan 78

BROVKIN, YU. N., VYSHEMIRSKAYA, N. A. and KOSTYLEV, S. A.

[Abstract] Gunn-effect oscillators operating in the transit mode with domain suppression have a limited frequency range, their upper cutoff being determined by the time in which a moving dipole will form. A theoretical study has shown and an experimental study confirmed the feasibility of raising this cutoff frequency by shortening the dipole formation time. The analysis is based on the dynamics of a Gunn domain forming at an optimum inhomogeneity in the cathode junction, as described by the Poisson equation with the equation of voltage balance and the equation of total current. The results indicate that formation of a moving domain at a cathodic inhomogeneity without prior formation of a static domain will effectively extend upward the frequency range of a Gunn-effect oscillator operating in the hybrid mode. Figures 2; references 5: 3 Russian, 2 Western.
[89-2415]

USSR UDC 621.385.125

ULTIMATE POWER AND EFFICIENCY OF AN INJECTION-TRANSIT DIODE

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 10, Oct 79 pp 84-88
manuscript received 30 Jan 79

PAVLOV, G. P.

[Abstract] The large-signal performance of an injection-transit diode is analyzed theoretically, taking into account second-order factors such as the dependence of the drift velocity on the electric field intensity and on time, as well as limitations due to carrier diffusion and carrier space charge. The mathematical one-dimensional model, applied specifically to a p+ -n-ν -p+ structure, yields expressions and curves describing the output power and the efficiency as functions of the a.c. voltage either at a fixed d.c. bias voltage and various frequencies or at various d.c. bias voltages and a fixed frequency. Both are found to peak sharply, but at levels lower than according to the first-approximation theories. Typically, the power output approaches 30 W/cm^2 and the efficiency approaches 1 percent at 8.5 GHz and a d.c. bias of 44 V. Figures 3; references 7: 1 Russian, 6 Western.
[89-2415]

USSR UDC 621.315.592

FORMATION, STRUCTURE AND PROPERTIES OF EPITAXIAL PACKING DEFECTS (REVIEW)

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian Vol 22 No 9, Sep 79 pp 3-12
manuscript received 18 May 78; after revision 23 Oct 78

MATYNA, L. I., PEKAREV, A. I. and CHISTYAKOV, YU. D.

[Abstract] A literature review, based primarily on the western literature. In most of the articles the authors limit themselves to description of packing defects in autoepitaxial layers of silicon grown from a vapor-gas mixture. The influence of packing defects on the parameters of semiconductor devices is described. Causes of packing defects are reviewed. Methods of elimination and prevention of the formation of packing defects in epitaxial layers are noted. It has been established that epitaxial packing defects disappear upon annealing in H_2. Argon annealing does not yield this effect. Figures 5; tables 3; references 27: 10 Russian, 17 Western.
[52-6508]

USSR UDC 537.2.213

A METHOD OF CALCULATING THE ELECTRIC CHARGE DISTRIBUTION OVER A CONDUCTING SURFACE

Minsk IZV. VUZ: ENERGETIKA in Russian No 8, Aug 79 pp 23-29 manuscript received 21 Nov 78

GRACH, I. M., candidate in technical sciences and lecturer, Frunze Polytechnic Institute

[Abstract] A new approximate analytical method of calculating the electric charge distribution over a conducting surface is shown which will make more problems more easily solvable. Expressions are derived for the surface charge density, on the basis of concepts in the more general approximate operator method applicable to electromagnetic fields. Cylindrical coordinates are used here for a smooth equipotential surface r=F (z,c) with c denoting a single constant or several ones. From the tangential gradient of the potential are determined first its radial gradient, then its axial gradient, and eventually the normal component of the electric field intensity at the surface. The latter yields the surface charge density in terms of F,F' and a correction factor M. The accuracy can be improved by replacing the first approximation by the second one, which establishes a fast converging iteration process. For illustration, this method is applied to a toroidal electrode which has an elliptical cross section. The calculation of the charge density and then also of the capacitance is by far less unwiedly here than by other known methods. While the first approximation yields a large error (40 percent) for the charge density and a not so large error (8 percent) for the capacitance, both errors are greatly reduced in the second and further approximations. Figures 2; tables 2; references 5 (Russian).
[68-2415]

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